MACHINE AND TOOL ENGINEERING

The TOOL ENGINEER

MAY, 1943

Official Publication of American Society of Tool Engineers

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REELOADING FIXTURES
...-date meth...ds which in- ...se machine tool operating ...icats down...ime! . . . pg. 84

PRODUCTION DATA SHEET
...w to obtain utmost produc- ...a from broaches, including ...ok and clearance angles and ...tting fluid recommendations.

SPLICING CLOTH BELTS
Complete details on Westing- ...house development . . . . pg. 101

PUBLISHED BY THE BRAMSON PUBLISHING COMPANY

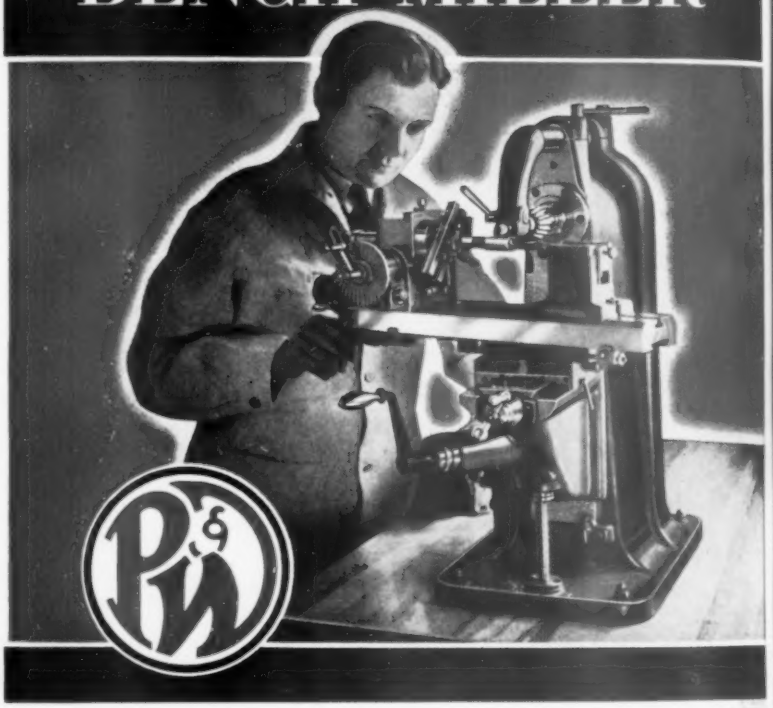
Don't tie up Big Millers on small, precision jobs

PRATT & WHITNEY

No. 3 Model "C"

UNIVERSAL

BENCH MILLER



NOW BREAKING many a bottleneck in toolrooms and on production lines as well, the P&W Bench Miller is a companion piece to the famous P&W Bench Lathe. Within its range, it handles *all* the jobs done on large, expensive, floor type millers . . . and, with its wide variety of special attachments, handles them *faster, more accurately, and more easily.*

OF SPECIAL INTEREST to owners of P&W Bench Lathes is the fact that the P&W Bench Miller of corresponding model has *completely interchangeable* headstock, collets, arbors, etc. Headstock, *with work undisturbed*, can be moved from one machine to the other, for a series of operations. This makes possible a degree of precision control which cannot be duplicated by other methods.

Get Details Now!

Company executives will receive free copies of this new bulletin if they will send their requests on their company letterheads.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD • CONNECTICUT

STANDARD SUPER Snap Gage

With SPHERICAL Gaging Pins *that involve no condition of parallelism . . . .* YET PROVIDE *greater* ACCURACY IN PRECISION INSPECTION

A new contact principle . . . . simple and practical*

As mass production is accelerated, the need for faster, simpler, and *greater accuracy* of inspection becomes imperative. Snap gages are commonly used to control finer tolerances, but strain on the locking device distorts the frame thereby rendering the gage inaccurate. This distortion tilts the flat surfaced pins a few .0001″ throwing them out-of-parallel to the common anvil, an important factor when tolerances are measured in .0001″.

The STANDARD Super Snap Gage with its SPHERICAL gaging pins eliminates out-of-parallelism. This new spherical-contact principle involves no condition of sustained parallelism. The SUPER Snap Gage is easily set, requiring no simultaneous adjustment to a given dimension and to parallelism. It simplifies inspection, assures greater accuracy, and speeds production and inspection.

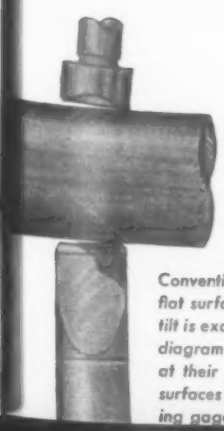
The return of out-of-parallel snap gages for correction is eliminated. Only pins and anvils need be held in reserve, instead of complete gages. The initial cost of the SUPER Snap Gage is no more. Pins are available as separate parts, to fit existing American Gage Design models.

(* Pat. Pending)

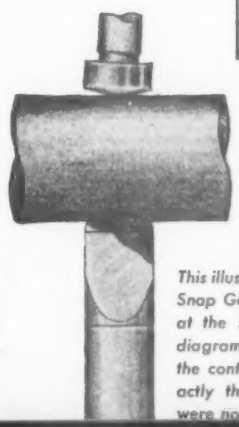
Send for Illustrated Folder

STANDARD GAGE CO., Inc.
Poughkeepsie, N. Y.

MASTER CRAFTSMEN MANUFACTURING precision GAGES AND INSTRUMENTS



Conventional Snap Gage with flat surfaced gaging pins. The tilt is exaggerated to make the diagram clear. Note that only at their edges do the gaging surfaces contact the piece being gaged.



This illustration shows the Super Snap Gage with the pin shank at the same angle as in the diagram at the left. Note that the contact conditions are exactly the same as if the pin were not tilted.

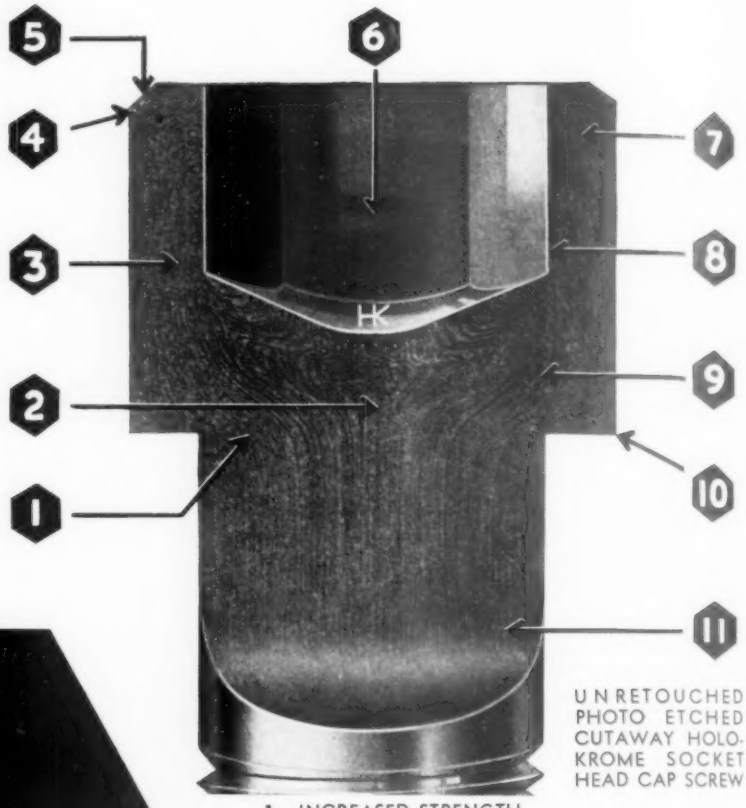
• *IMMEDIATE DELIVERY from stock* •

Super Snap Gage mounted in a bench stand for convenience in checking.

Completely Cold Forged

THE RESULTS OF A SUPERIOR METHOD PATENTED AND USED EXCLUSIVELY BY

HOLO-KROME



UNRETOUCHED PHOTO ETCHED CUTAWAY HOLO-KROME SOCKET HEAD CAP SCREW

1—INCREASED STRENGTH.

2—CONTINUOUS UNCUT LATERALLY DEFLECTED CORE FIBRES.

3—CONTINUOUS UNBROKEN FIBRES.

4—SMOOTH FLAT TOP WITH SLIGHT CHAMFER.

5—CONCENTRICITY OF HEAD WITH BODY.

6—SOCKETS — UNIFORMLY ACCURATE TO FULL DEPTH OF HOLE — TRUE HEXAGONAL SHAPE — ACROSS FLAT SECTION DIAMETER IDENTICAL TOP AND BOTTOM — NO TAPER — SMOOTH REGULAR WALLS — WELL DEFINED CORNERS.

7—CONTINUOUS FIBRES ENDING IN SOCKET WALLS.

8—RE-INFORCED SOCKET WALLS.

9—CONTINUOUS UNCUT FIBRES.

10—SQUARE SHOULDERS.

11—ORIGINAL CONTINUOUS FIBROUS STRUCTURE.

The TOOL ENGINEER

VOL. XII T.M. REG. U.S. PAT. OFF. No. 5

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Business Manager

J. M. KAMBERG
Circulation Manager

TECHNICAL FEATURES

Chevrolet Builds Radial Engines 67
Stop End Thrust 73
Three Reamer Applications 76
Thread Grinding Fixture Salvages High Speed Steel End Mills 77
Latest Developments in Glass Gages ...78
Dimensional Limits of Acme Screw Threads 82
Milling Arcs in an Eight Foot Plate 83
Preload for Production 84
Wood-Working Saw Applied to Metal Cutting 88
Multiple Automatic Drill Ups Production 350% 89
Broach and Hob Spiral Splines 91
Westinghouse Machine Tool Forum 92
A Rapid Tooling Method 94
Production Data Sheet 97
The Crib 98

MEN, MATERIALS and MACHINES

Production Perspectives 65
A New Technique in Wartime Belting..101
New Materials and Methods for Tool Salvage 107
Torpedo Manufacture at International Harvester 110
Capital Communique 115
Industrial News Digest 121
Army-Navy "E" Award Winners 130
Production Pix 133
New Equipment 165
New Literature 186
Handy Andy Says 196
A.S.T.E. Doings 200
Passing Parade 212
May A.S.T.E. Meetings 224
Classified Advertising 224
ADVERTISERS' INDEX 226

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MAY, 1943.

★

WHEN HELP IS NEEDED MOST

WE once looked with favor upon overall plant stories. An article of this type had something for everybody, not to mention that there was less wear and tear on writers when they could gather material for several pages on a visit to one plant.

Today, however, the overall feature does not fit THE TOOL ENGINEER'S policy of giving the reader an immediate return for the time spent on the article. Articles which tell all about one application, what tools are used, how much production may be expected, those, we think help when help is needed most.

Generally one-half to three pages long, they should have broad applicability. Such stories are on the multiple drill . . . page 89, preloading fixtures . . . page 84, broaching an internal spiral spline . . . page 91, specific reamer designs . . . page 76, milling on a radial drill . . . page 83.

The article on the Chevrolet plant in Buffalo—building radial engines emphasizes a particular phase of production—operational sequence and plant layout problems, particularly in converting ready-built space. But it also shows concretely what production engineers are getting out of this war.

Working to new precision, Chevrolet engineers are learning methods which they believe will contribute to doubling auto production. There is only one problem, not with Chevrolet, but with industry and industry's suppliers in general, which may invalidate the lessons we are learning. That problem was well stated by Judge Thurman Arnold (either he's changed or we've been converted) in a speech to the Economic Club of New York. "If your whole thinking is obsessed with the idea of security, the same thing will happen to your industrial structure that happened to the French army . . . obsessed with the idea of the Maginot Line. We must get back to the old economics of opportunity, of taking a chance . . . and I think this war is going to do it for us.

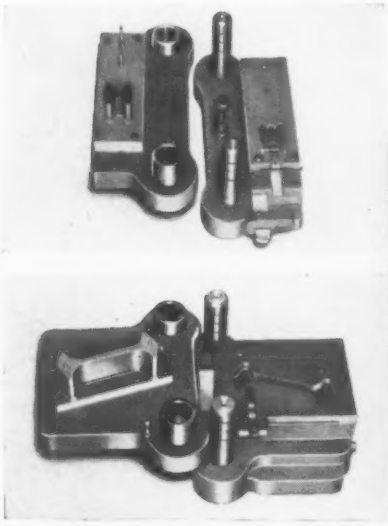
"The only thing we need to get over is our fear of full production—our idea that wealth consists of sitting in a position where you can collect money by restricting production. I think the labor monopoly is really a product of the industrial monopoly. With the light metals, the plastics, the synthetic rubber, the new fuels, the unleashing of inventive and productive capacity which this war is bringing about, we are on the verge of a new industrial age."

Every once in a while, somebody writes a letter that curls our toes, but we didn't mind the recent sizzler about not getting THE TOOL ENGINEER regularly. That's a tribute. This complaint concerned the circulation department's inability to keep up with a reader's wanderlust. Think of moving five times a year. Only an engineer could accomplish such a feat.

"One of the most Outstanding Machines I've ever seen"

JOHN W. RIX, *Mfg. Engineer*
Cessna Aircraft Co.

The Milwaukee Rotary Head Milling Machine "Under Fire" At Cessna



On tools like these no layout was required. All machining was done by working to "dial" graduations. Direct measurements were eliminated.

Proof That This Machine "Has what it takes"

Is Found In Mr. Rix's Statement:

"I consider the Milwaukee Rotary Head Milling Machine to be one of the most outstanding machines I've ever seen for tool room work. It paid for itself in the first few months of operation. We have repeatedly accomplished feats which I would not have believed possible if I had not seen them myself."

(signed) JOHN W. RIX

Since purchasing their first Milwaukee Rotary Head Milling Machine, Cessna Aircraft has milled hundreds of complicated blanking dies of geometrical form. Furthermore, they milled the punches to fit these dies with .001" clearance in between without resorting to hand fitting of any kind.

This meant that the punches and dies were heat-treated at the same time. Then, after surface grinding, they were ready for mounting on the die set.

The Milwaukee Rotary Head Milling Machine is without equal in the high speed, accurate, economical production of dies, molds, hobs, as well as the precision machining of many parts. In a single set-up, it performs layout, milling, drilling precision boring and slotting operations—mills circular and angular cuts in both vertical and horizontal planes.

The "Machine of Tomorrow" — here today!

As a leader in your field you should have the complete story on the Milwaukee Rotary Head Milling Machine and its remarkable, low-cost performance. Write for Bulletin 1002A.

Rotary Head Milling Machine
•
Automatic Jig Borers
•
Center Scope

Kearney & Trecker Products
CORPORATION
Milwaukee, Wisconsin
Subsidiary of Kearney & Trecker Corporation

Milwaukee Face Mill Grinder
•
Milwaukee Midgetmill
•
Milwaukee Speedmill

3 more war jobs *Stepped up* with Standard's new cutting fluids

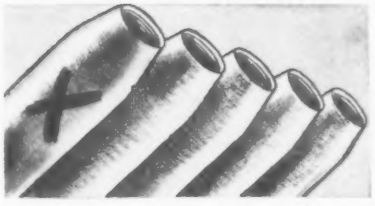
• New cutting fluids developed by Standard research men, and new applications of time-tested quality products by Standard Cutting Oil Specialists, are ironing out production kinks on all types of metal-forming jobs.

Do the typical examples below suggest a solution to any of your problems?

Heat-treated alloy gives cutters a beating. Milling wing struts of 4340 steel, with a Brinell hardness of 375, was one of the production bottlenecks in a western airplane plant. Cutters had to be ground after producing only 10 struts—frequently oftener. Among the cutting oils tested at this plant was Stanicut 155SC, recommended by a Standard Oil Engineer for this operation. Production immediately jumped to 25 struts per tool grind—a marked saving of both production time and tools.

STANICUT

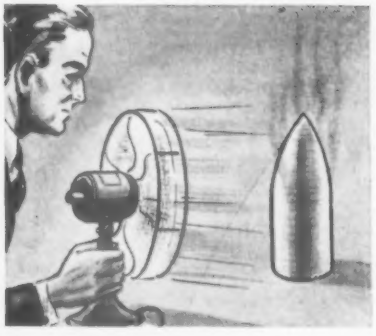
Stanicut 155SC is one of a number of cutting oils Standard has developed recently. It is particularly designed for machining the tougher alloy steels. It contains the maximum amount of sulfur practicable to incorporate in a transparent oil—one reason for the longer tool life it gives.



Inspector says "No" once too often. Threading the nose of 90 mm. shells seemed to be a simple operation; but when a conventional soluble oil was used, the shells frequently failed to pass inspection because of rough threads. Too frequently, the manufacturer decided; and he turned the problem over to a Standard Cutting Oil Specialist. Another new product—Stanicool H. D. Soluble Oil—was put on this operation. Rejections became practically nil.

STANICOOL H. D.

Stanicool H. D. is a soluble oil to which special compounds have been added to reduce adhesion of the tool and chip. It not only gives better finish, but it also increases tool life on jobs requiring the extra cooling qualities of a soluble oil.



Too hot to handle. On a cold nosing operation in the production of 90 mm. shells, friction in the die and the plastic flow of the metal generated excessive heat. With the stamping compound then being used, the shells came out of the dies smoking. Handling them was a problem.

A test of Stanostamp was arranged. With it, the shells could be touched with bare hands immediately after coming from the die, which greatly facilitated handling.

STANOSTAMP

Stanostamp is a time-tested product that has gone to war on many shell and shell-case operations. It reduces wear on dies and prevents sticking.

What's your problem? A Standard Cutting Oil Specialist has detailed information on many metal cutting and forming problems like this, both from his own experience in applying these new cutting fluids to war jobs and from the information relayed to him by the Standard Oil Technical Department. He has, or can get, the answer to any cutting oil problem you have. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Ill. In Nebraska, write Standard Oil Company of Nebraska at Omaha.

OIL IS AMMUNITION . . . USE IT WISELY

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

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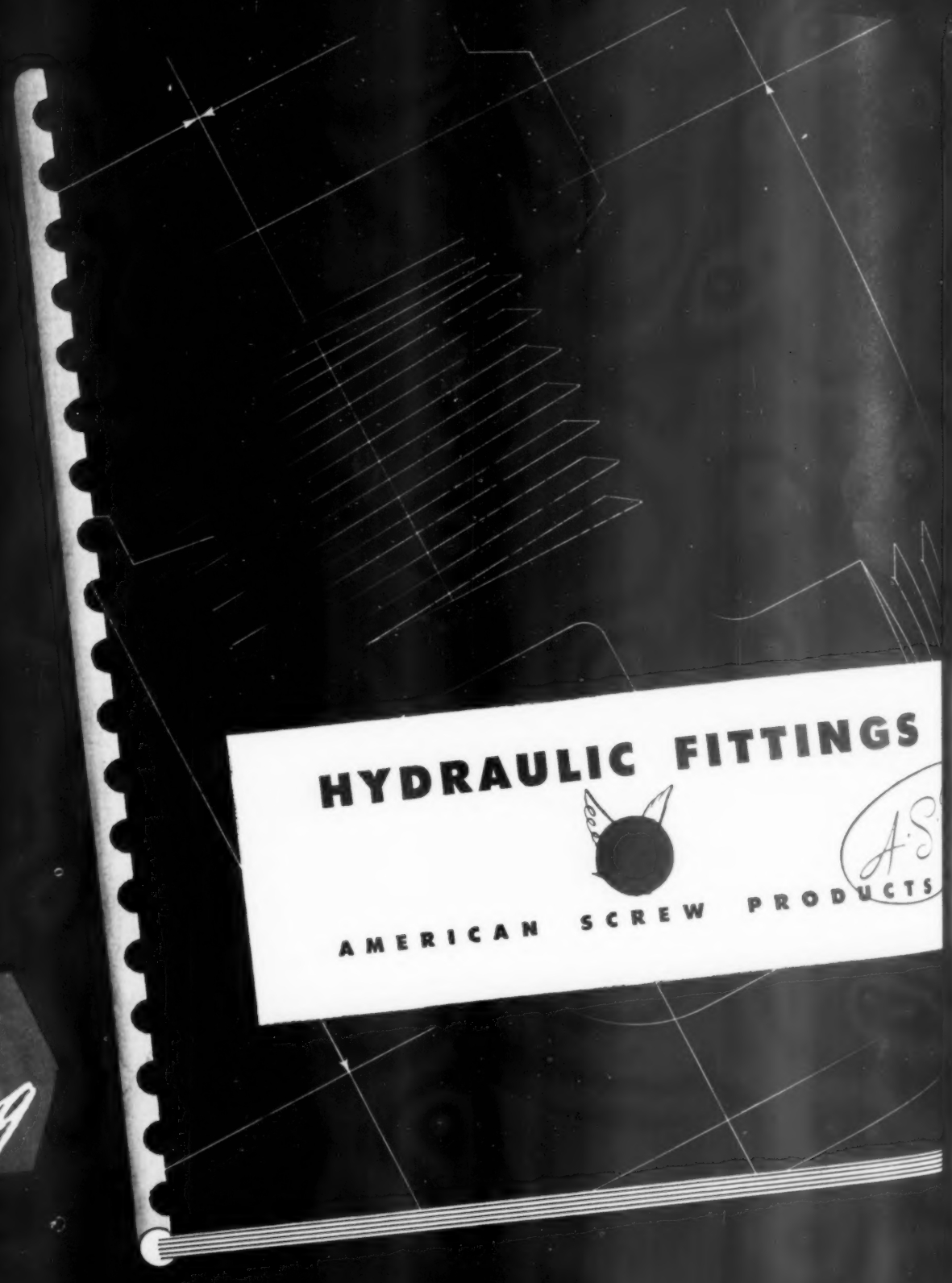
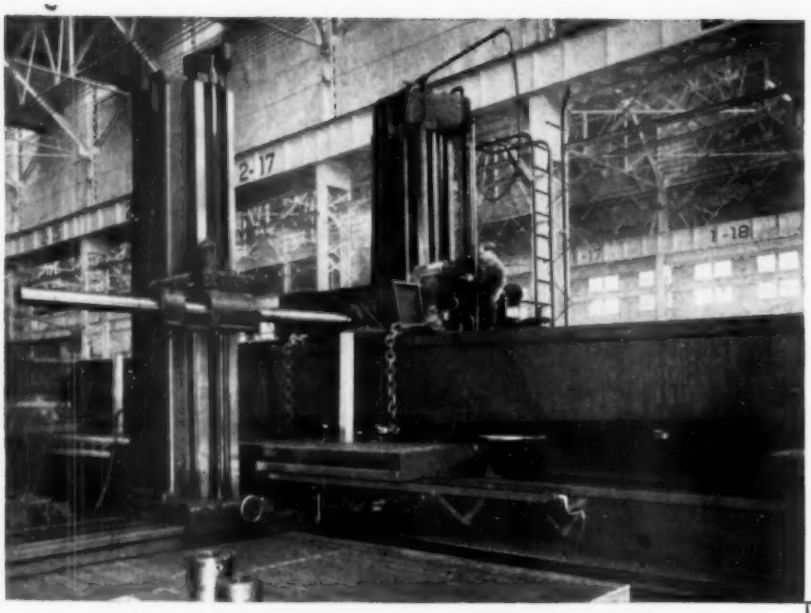


New Catalog

This new 64-page catalog describes, illustrates, and gives engineering data on over 600 hydraulic fittings, manufactured of brass and aluminum alloys. Sections are devoted to Air Corps, Army-Navy, and Naval Aircraft Factory series. Write today, on your firm letterhead, please, and this catalog will be rushed to your desk.

7000 AVALON BOULEVARD • LOS ANGELES, CALIFORNIA

Photo Courtesy International Business Machines



(*Above*) *Boring 10⅛" Dia. Hole in Gear Case of Boom*

How To Machine Large Parts . . . *in fewer settings!*

10 Operations Completed in 3 Settings of Shovel Boom . . . Wgt. 32,000 Lbs.

(*Above*) *32,000-lb. Welded Steel Boom*

Manufacturers of heavy cumbersome equipment can use the versatility of G & L machines to good advantage. The variety of available operations such as boring, drilling, milling, facing *and tapping* often makes it possible to perform numerous operations in one setting. Lost time in moving the part to other machines and resultant inaccuracies are eliminated.

In this installation a 48-ft. long welded steel shovel boom is machined completely in only three settings. Ten operations, including milling, boring, facing and drilling, are performed.

Since the machine table is 25 feet shorter than the shovel boom, great care is exercised in setting it up for machining. All strains of overhang are shimmed out, while ends are supported by jacks. The job is then bolted to the machine table and jacks removed.

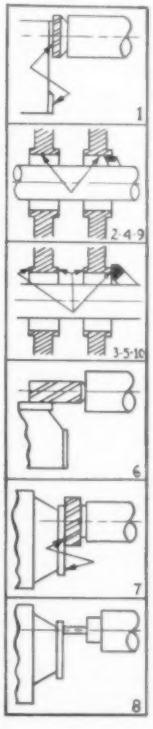
G & L machines are being used for unlimited machining operations on both small and large parts in many industries. With G & L attachments and accessories there is practically no combination of operations that cannot be performed with great speed and economy. Feeds and speed ranges cover all metals, and practically any cutting requirements.

G & L engineers will be glad to make recommendations for faster machining of your work on present or new G & L equipment. They are at your service without obligation.

Versatility:

FOR PROPER MACHINING SEQUENCE AND FEWER SETTINGS

Proper machining sequence is available through ample feeds and speeds and versatility of G & L machines. The ten operations on the shovel boom are shown below:



FIRST SETTING:

OPERATION 1—Mill eight pads for set-up purposes on Operation No. 7.

OPERATION 2—Bore two 10⅛" diameter bores in gear case. (3 cuts, rough, semi, and finish.)

OPERATION 3—Face and back face both sides of bores.

OPERATION 4 — Bore two 8.377" holes for intermediate gear shaft.

OPERATION 5—Face and back face both sides of bores.

OPERATION 6—Mill strip on top face of gear case for alignment purposes in Operation No. 7.

SECOND SETTING:

BOOM ROLLED OVER 90° AND PARALLELS PLACED UNDER PADS MILLED IN FIRST OPERATION

OPERATION 7 — Mill top of gear case.

OPERATION 8 — Drill twenty-two 11/16" holes in gear case cover flange.

THIRD SETTING:

BOOM TURNED AT ANGLE OF 39° 14′ 17″ TO CENTER LINE OF SPINDLE

OPERATION 9 — Bore two 5½" holes for worm drive.

OPERATION 10—Face and back face both sides of bores.

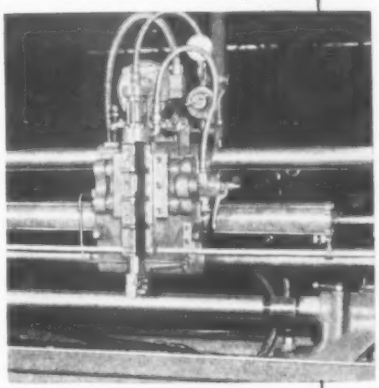
GIDDINGS & LEWIS MACHINE TOOL COMPANY

132 DOTY ST., FOND DU LAC, WISCONSIN

Free Data *Information covering the complete line of G & L machines and time-saving attachments and accessories is included in this catalog. Write for your copy. Ask for Catalog No. 55.*

HOW TO IMPROVE MACHINE PERFORMANCE BY ELIMINATING SURFACE DEFECTS!

Here's How One Manufacturer Improved Machine Performance by Superfinishing Steel Ways...



This manufacturer of a small boring machine superfinishes the steel ways to 3 micro-inches. To obtain the required sensitive, smooth movement over the ways, a Foster Superfinishing Machine was used to remove surface defects, such as diamond marks and chatter marks caused by previous machining operations. Machine performance was improved by superfinishing the ways to an extremely fine surface, which reduces wear and maintains absolute accuracy.

JOB DATA

Machine—Foster General Purpose Superfinisher, 4″ x 36″.

Part—Steel ways for small boring machine.

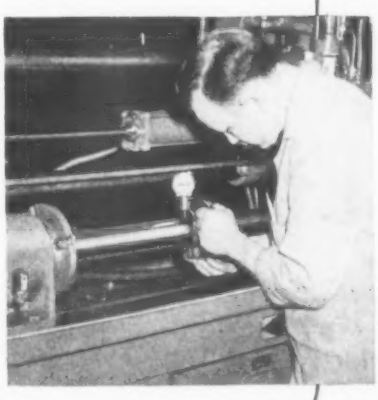
Part Size—2⅜″ dia. with lengths from 24″ to 38″.

Material—Steel, hardened to 62-64 Rockwell.

Previous Finishing Operations—Grind to 10-15 micro-inches.

Superfinishing Operations—Finish to 3 micro-inches.

Production—40 to 45 minutes to superfinish a 30″ long "Way."



Superfinishing, the new process for producing fine surface finishes and removing surface irregularities, improves your product these four ways: (1) Eliminates run-in period (2) Eliminates friction heat (3) Eliminates bearing wear (4) Eliminates vibration and chatter. Foster Superfinishing Machines will solve these four common machine troubles by removing the surface defects usually found in any machined surface. They are capable of producing geometrically improved surfaces of 2 to 3 micro-inches with only .0001″ to .0002″ stock removal.

SUPERFINISHING ELIMINATES THESE SURFACE DEFECTS

1. The familiar ridges produced by the point of a turning tool.
2. Grinder feed spirals, chatter marks, grinder flats, and other defects caused by grinding inaccuracies.
3. The defective condition caused by the violence with which the tool or grinding wheel removes metal, leaving the surface covered with partially loosened splinters of metal.
4. The metallurgical changes in the surface layer of metal caused by heat from grinding.

GET THIS FREE DATA

Send for free booklet with superfinishing data, and complete details on extensive line of Foster General Purpose and Special Machines for miscellaneous or production superfinishing. Write to International Machine Tool Corporation, Foster Division, 1104 W. Beardsley Ave., Elkhart, Ind.

INTERNATIONAL MACHINE TOOL CORPORATION

FOSTER DIVISION, ELKHART, INDIANA · LIBBY DIVISION, INDIANAPOLIS, INDIANA

MAIN OFFICE AT ELKHART, INDIANA

FOSTER FASTERMATICS · LIBBY HEAVY DUTY TURRET LATHES · STANDARD TOOLS
SUPERFINISHING MACHINES · BARKER CHUCKS · UNIVERSAL RAM TYPE TURRET LATHES

YOU PROBABLY remember the huge number of bombers you lost over England a while back, don't you? And most of them from those -‡$%&@*" @&*$%‡" ACK-ACK guns, too!

Well, confidentially, Schicklgruber, though we can't tell you much (these guys keep things so darned secret around here), we can inform you that we had a little part (not much, mind you, but a little) to play in that show.

Above is a photo (sorry it's been painted out so much) of a [redacted] that we had something to do with, and that had something to do with something that had something to do with the losses you had over England. Remember?

Now, Schicklgruber, this is strictly confidential, and we don't want you to tell it to a soul, except maybe a few of our customers. We may be able to fix up something as accurate for them some day.

VINCO CORPORATION
8857 SCHAEFER HIGHWAY, DETROIT, MICHIGAN

Universal Camming means that CLEVELANDS CUT COSTS

EVERY operation on a Cleveland Single Spindle Automatic is controlled by standard cams, easily reached and quickly set to any position with the aid of a universal adjustment feature. Set-up time is reduced to a remarkable minimum by the speed and ease with which tools can be readied for processing of any job within the scope of the machine. ● With men responsible for production, Cleveland Single Spindle Automatics have a reputation for two important advantages: **1.** Maximum sustained production on long runs, with minimum down time for adjustments. **2.** Profitable economy on small lot, short run jobs. **CLEVELANDS** are proving on hundreds of war production jobs that they **cut costs** *and* speed production.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

CLEVELAND, OHIO

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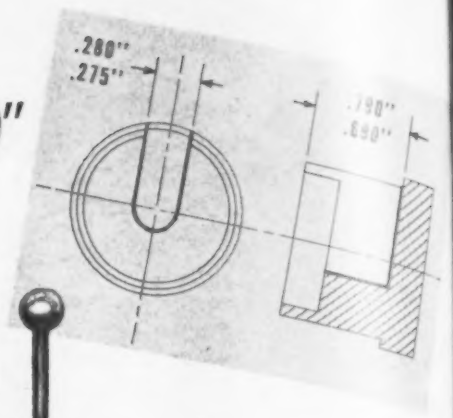
JUST 6 SECONDS

To Finish a .280" x .690" Slot from the Solid



Heald Bore-Matic *plus* Heald tooling boosts production to *600 per hour* on shell fuse parts

Finishing a slot .280" wide x .690" deep from the solid is ordinarily a comparatively slow process . . . too slow in fact to produce brass shell fuse parts requiring this operation in the huge quantities needed today. Heald field engineers when called in on the job recommended, not a battery of machines, but the single compact Heald Bore-Matic shown above. This Bore-Matic is a No. 49 machine, double-end, with six boring heads carrying end-mills and a six station fixture mounted on a hydraulic cross-slide used for feeding in a side cut. Three fuse parts are slotted simultaneously, three others being loaded meanwhile. Production is 600 per hour, entirely meeting the customers' requirements. Such high production is obtained with a standard Heald Bore-Matic, all units being standard with the exception of tools and fixture. And this job is not an isolated case. Every day Heald Engineering works out equally successful arrangements for getting out more work with more precision. Let's get to work now on your problems in precision boring, turning, facing, chamfering and grooving. Write, phone, or wire us today.

More Precision Faster

THE HEALD MACHINE CO. *WORCESTER, MASS. U. S. A.*

MANUFACTURERS OF PRECISION BORING AND PRECISION GRINDING MACHINES

When Hair-Splitting is Crude Work

Split-hair accuracy isn't close enough for today's production. Tools have to be specifically *designed and built* to hold the work to the invisible tolerances now required on many parts. And that's a **HECKER** specialty.

Frequently the character of the tool, jig or fixture is the difference between precision work at normal speed (or less) and the same precision work on stepped-up production cycles.

HECKER tool engineers are serving a wide range of industries, whose names read like an industrial Blue Book. This accumulated experience with men and machines of all types is ready to tackle your tooling problems.

Furthermore, these engineers are in close contact with the **HECKER** production of precision parts for leading aircraft manufacturers. They know at firsthand how their tool designs are performing.

Give us a real tooling problem to solve for you. Discuss it, no strings attached, with one of the **HECKER** field engineers. Write to A. W. Hecker, 1988 East 66th Street, Cleveland, Ohio; or, 517 New Center Building, Detroit, Michigan.

A★W★ Hecker

DESIGNERS AND BUILDERS OF TOOLS, JIGS AND FIXTURES . . . FABRICATORS OF AIRCRAFT PARTS

EVERY AIRPLANE PRODUCED IN THIS COUNTRY *has, in its motor, parts made on* EX-CELL-O PRECISION MACHINES

IT'S A FAR CRY from the small 12 h.p. motor that Wilbur and Orville Wright produced in their bicycle shop forty years ago for the first American flying machine . . . to the precision-made engine that makes aviation a vital factor in today's warfare. It's a difference of many hundreds of horsepower, of innumerable mechanical inventions and refinements, of new processes in the applied art of aeronautics —all giving to the modern aircraft power plant a stature undreamed of by the pioneering Wright brothers. As in many other industrial directions, America is now foremost in the production of aircraft engines, both as to quality and quantity. This attainment has been due primarily to the tremendous strides that have been made in machine tools that could adhere to extremely close manufacturing tolerances, and could produce repeatedly, for interchangeable use, and at great and sustained speed, the thousands of precision parts that make up the aircraft engines of today. *In the construction of every airplane engine produced in this country—parts are used that are machined on one or another of the various precision machine tools made by Ex-Cell-O.*

EX-CELL-O CORPORATION • DETROIT, MICH.

To left: Ex-Cell-O Precision Thread Grinder No. 33 (one of nine Ex-Cell-O styles) widely used in aircraft industry for production of accurately threaded parts. . . . EX-CELL-O precision thread grinders grind fine threads directly from heat-treated blanks and finish grind coarser threads after heat treatment.

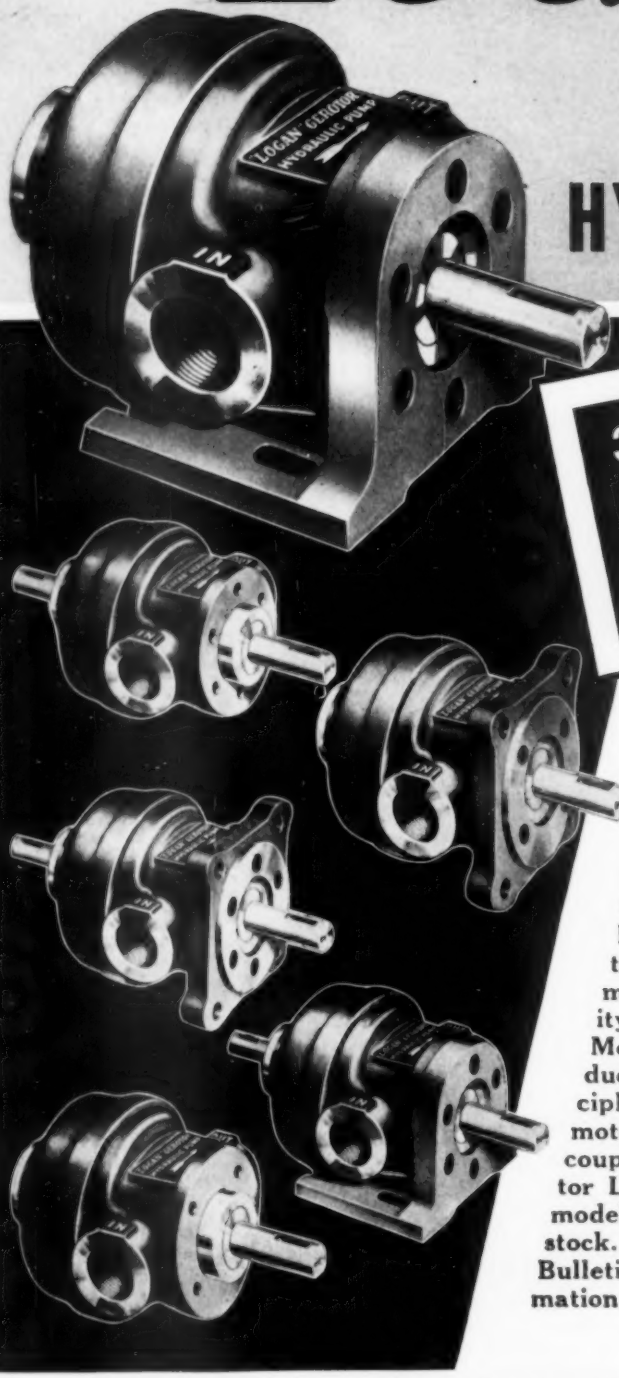
XLO

EX-CELL-O *means* PRECISION

Precision THREAD GRINDING, BORING AND LAPPING MACHINES • TOOL GRINDERS • HYDRAULIC POWER UNITS • GRINDING SPINDLES • BROACHES • CONTINENTAL CUTTING TOOLS • DRILL JIG BUSHINGS • DIESEL FUEL INJECTION EQUIPMENT PURE-PAK CONTAINER MACHINES • R. R. PINS AND BUSHINGS • PRECISION PARTS

"LOGAN"

GEROTOR HYDRAULIC PUMPS



3/4 to 30 G.P.M. CAPACITIES 1000 P.S.I.

"LOGAN" offers a line of 1000 P. S. I. Gerotor Oil Hydraulic Pumps for industrial applications. Simple, efficient and compact these pumps are designed and built to operate continuously in capacities ranging from 3/4 to 30 G.P.M. "LOGAN" Gerotor Pumps possess many advantages: Long Life, only three moving parts—Interchangeability, all parts interchangeable—Mechnical Efficiency, very high due to patented Gerotor principle—Speed, pump revolves at motor speed through direct coupling. The "LOGAN" Gerotor Line is complete with most models and sizes available from stock. Write or wire today for Bulletin 480 and complete information.

WRITE FOR *New* "LOGAN" GEROTOR BULLETIN 480

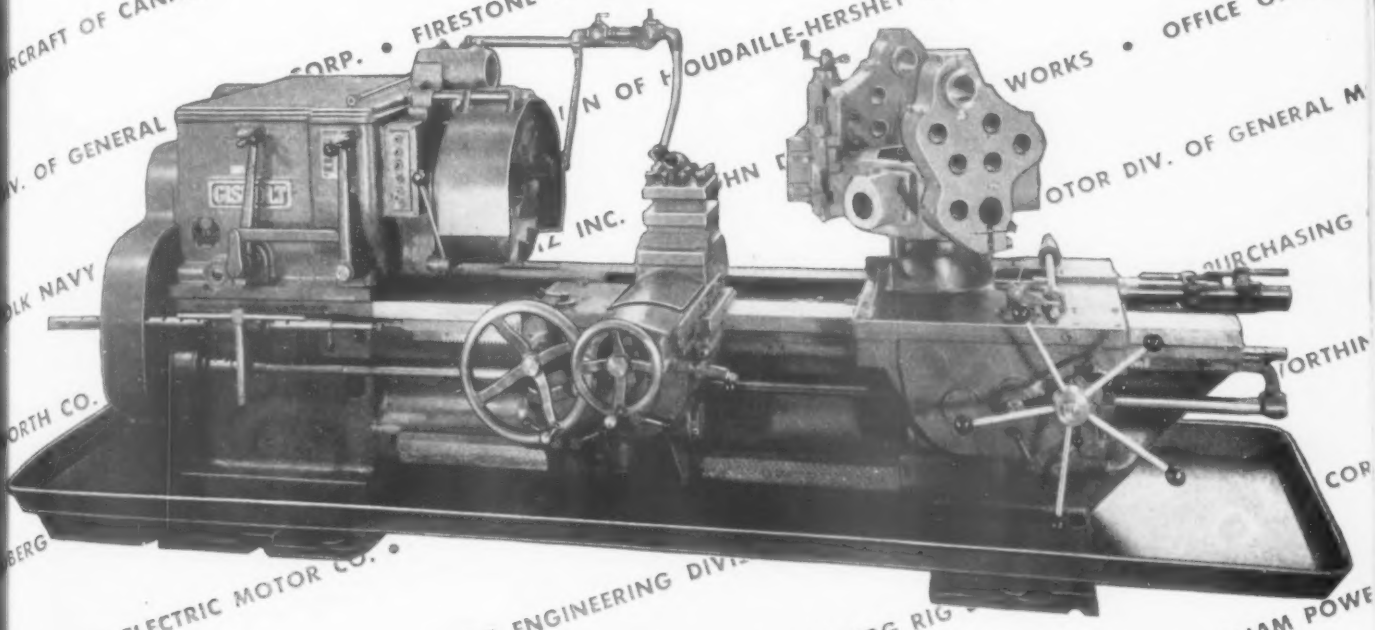
LOGANSPORT MACHINE, INCORPORATED

902 PAYSON ROAD LOGANSPORT, INDIANA

★ MANUFACTURERS OF AIR AND HYDRAULIC DEVICES, CHUCKS, CYLINDERS, VALVES, PRESSES AND ACCESSORIES ★

Patronage of world-known names

is significant



GISHOLT 3-R AND 4-R SADDLE-TYPE TURRET LATHES

The immediate acceptance of these new Gisholt lathes by leading manufacturers, indicates the sound engineering principles they embody and the important contribution they are making to the war effort.

The Gisholt 3-R and 4-R models are large, saddle-type turret lathes, built in two sizes: 21″ and 24″ chucks; 5¼″ and 9¼″ spindle bores. Literature on request.

GISHOLT MACHINE COMPANY
East Washington Avenue • Madison, Wisconsin

VERY EARLY DELIVERIES

GISHOLT

Look Ahead—Keep Ahead With Gisholt Improvements in Metal Turning

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

Another Wartime Suggestion

FROM MADISON-KIPP

If you use Tungsten Carbide Tools you have probably had some rather troublesome tool upkeep problems. We have solved some of these problems in our own war production work by using Kipp Diamond Wheels in the Model H Kipp Air Grinder. Contrary to previously held ideas, it is entirely practical to diamond grind by hand. The Model H Grinder has a speed of 50,000 R.P.M. With this speed and Kipp Diamond Wheels, Tungsten Carbide tools can be ground right at the machine. The price of the Model H Kipp Air Grinder is $29.75 and the price of a 1/4 x 1/8 Kipp Diamond Wheel is $5.43. The investment is extremely low. The value in production is sometimes extremely high. Kipp Air Grinders, fixtures, and accesories, have been developed by practicing tool-makers so they *are* practical.

Madison-Kipp Corporation,
209 Waubesa Street, Madison, Wis., U.S.A.

KIPP *air* GRINDERS

Like No Other War in History

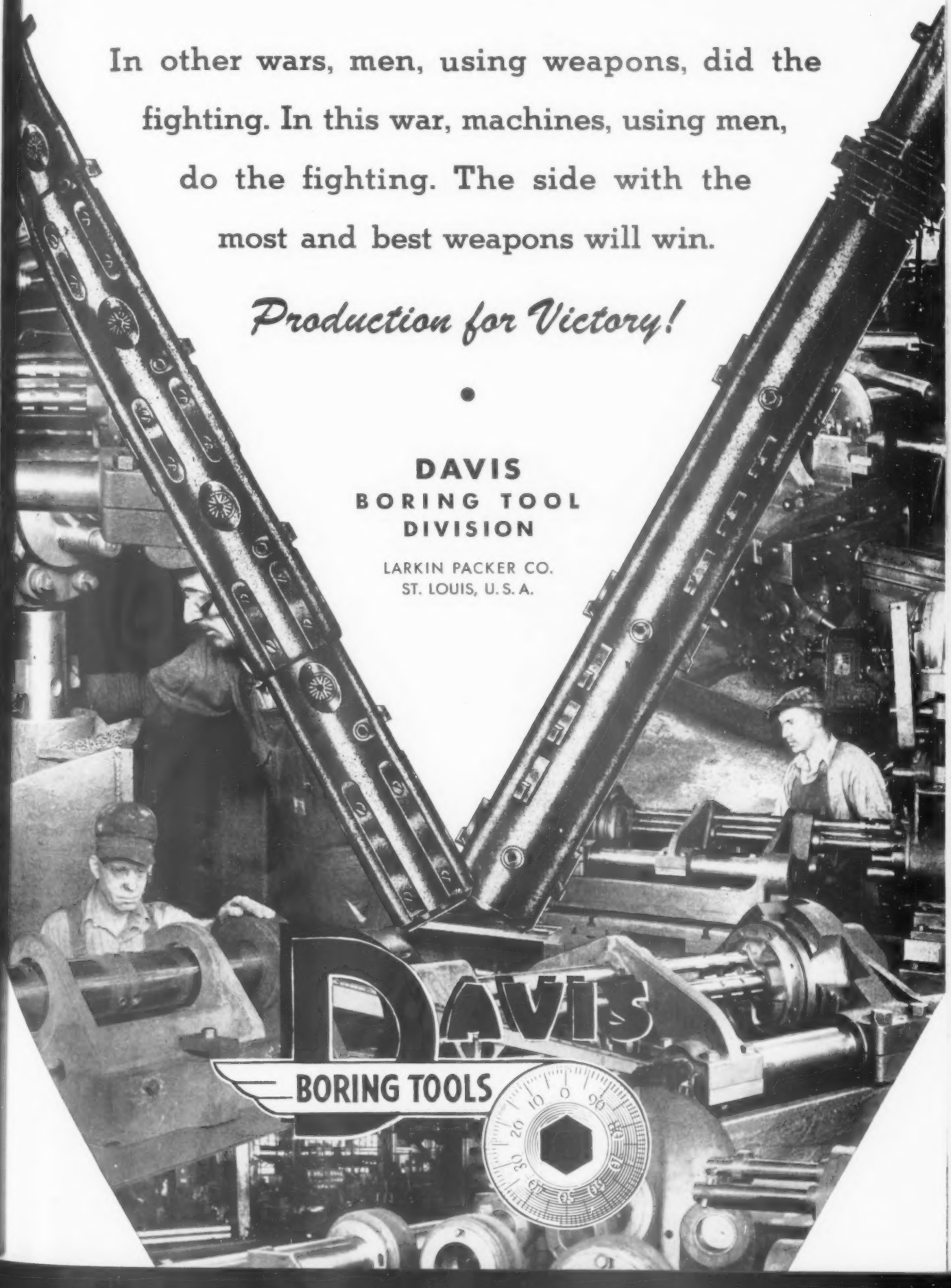
In other wars, men, using weapons, did the fighting. In this war, machines, using men, do the fighting. The side with the most and best weapons will win.

Production for Victory!

•

DAVIS
BORING TOOL
DIVISION

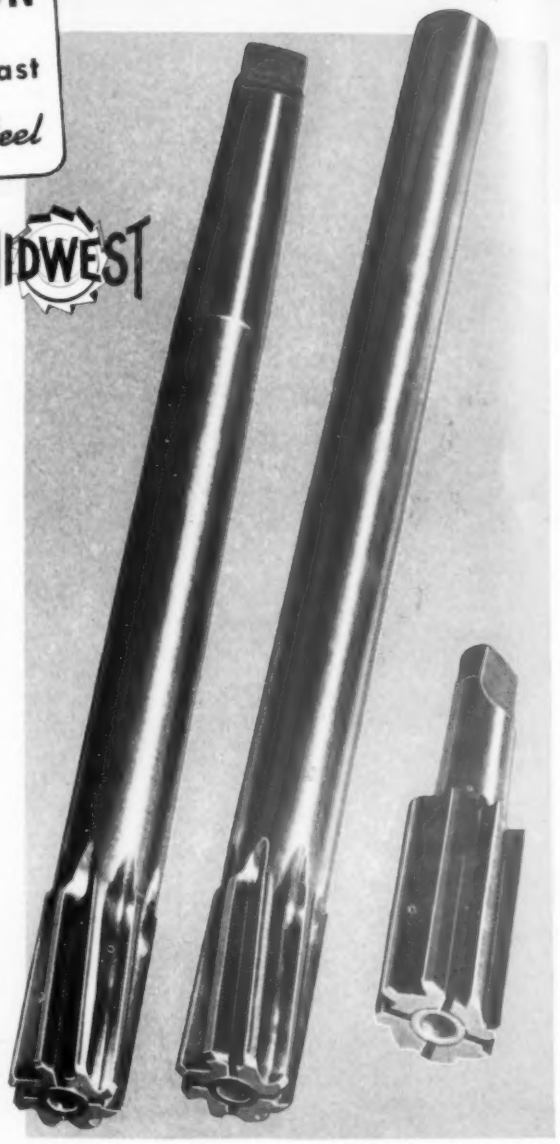
LARKIN PACKER CO.
ST. LOUIS, U. S. A.



How MIDWEST EXPANSION REAMERS make fewer reamers last longer, help conserve *High Speed Steel*

ONE MIDWEST REAMER EQUALS THE LIFE OF 6-18 SOLID TYPE, HIGH SPEED REAMERS OF THE SAME SIZE.

MIDWEST



These reamers, quickly and easily expanded oversize to compensate for wear or to slightly increase reaming diameter, represent the equivalent of one more high speed solid type reamer each time they are expanded. And the delay and cost in securing additional reamers are avoided. The smaller sizes can be adjusted approximately 1/64″; the larger ones, almost 1/16″.

Simple and Accurate Adjusting

The end of the expanding plug is provided with a hexagonal hole and is adjusted with a small hex wrench. Expanding the reamer is thus a simple, quick operation of a few seconds, and the screw action permits very accurate adjustments.

They Help Save High Speed Steel

Midwest expansion reamers are made with a tough, alloy shank giving strength and elasticity back where strain occurs, and with a welded high speed steel cutting end; thus combining adequate strength and wearing qualities with conservation of high speed steel.

Save and Conserve

We can't all fight with weapons but there are ways in which each of us can help win the fight; we can save, conserve and use with utmost care every tool, every piece of equipment, every bit of material which can in any way contribute to our winning the war . . . and to help equip our fighting men, we can buy defense bonds and stamps.

MIDWEST

Precision METAL CUTTING TOOLS

END MILLS • SLEEVES • COUNTERBORES • SPECIAL TOOLS • DRILLS REAMERS • FORM TOOLS CARBIDE TIPPED TOOLS ADJUSTABLE HOLDERS

MIDWEST TOOL & MFG. CO. • 2364 W. JEFFERSON AVE. • DETROIT, MICHIGAN

IN AIRCRAFT PRODUCTION

This Baker Machine Works on Exhaust and Intake Rocker Arms for Aircraft Engines.

ARMY E NAVY

AWARDED FOR EXCELLENCE IN WAR PRODUCTION MARCH 20, 1943

Model 36-HO

Write today for complete information on this machine

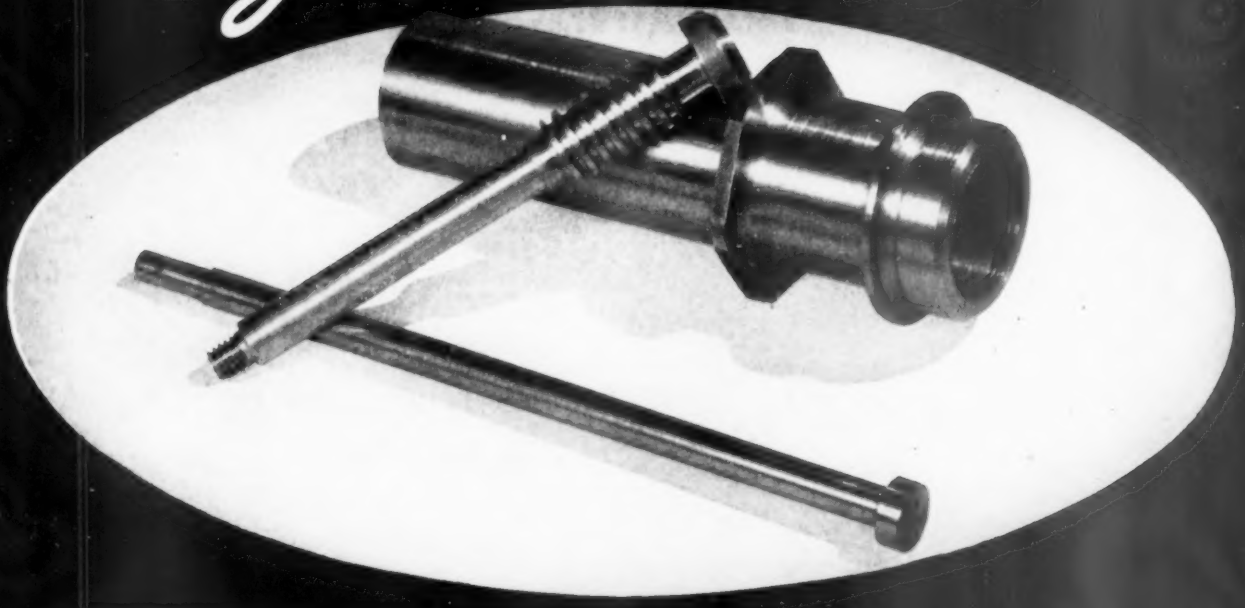
This vertical CLEANLINE heavy duty single and multiple spindle drill with hydraulic feed, is set up to drill, counterbore, rough, and finish ream. Used by the manufacturer of one of the leading aircraft engines, this machine takes part in the manufacture of exhaust and intake rocker arms. In this case, it is furnished with an 8-spindle, fixed center multiple head and the base with a 40 inch diameter shallow type ball bearing hand index table.

BAKER BROTHERS, INC. TOLEDO, OHIO, U.S.A.

DRILLING • BORING • TAPPING • CONTOUR GRINDING MACHINES

BAKER

WILL YOUR DIE HEADS *do jobs like these?*



1⅝" Self-opening Head with Circular Hollow Mills

In the same rigid head, circular thread chasers are interchangeable with hollow milling cutters and blocks.

National Acme Engineers will gladly work with you on special or difficult hollow milling and threading operations.

NEW PRODUCTION RECORDS, for both precision and speed, are being made with Namco Circular Cutter Hollow Mills.

On a wide variety of end forming and end turning operations, these tools bring to many production plants important new advantages over single point milling tools—

1. Same "double duty" head used for both threading and end forming cuts.
2. Circular type cutters have 270° of circumference available for regrinding.
3. Cutters removed for grinding without disturbing setup, and replaced without changing precision in work.

Catalog D-42—sent on request—will bring you valuable help in saving time, increasing production, and reducing costs.

THE NATIONAL ACME CO.

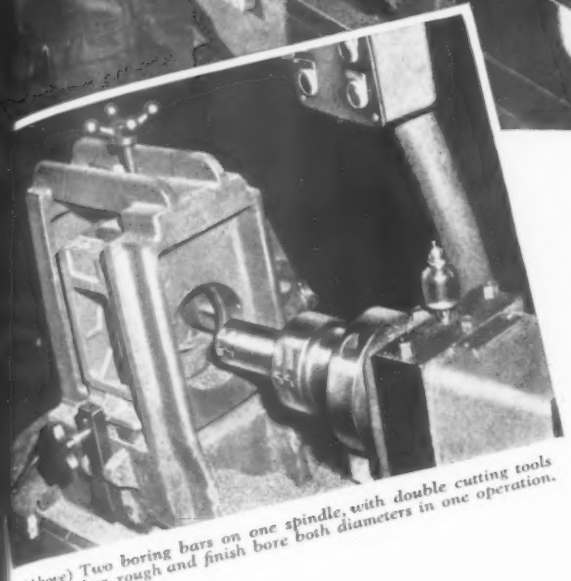
170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • SCREW MACHINE PRODUCTS • THE CHRONOLOG • LIMIT SWITCHES • POSITIVE CENTRIFUGE • CONTRACT MANUFACTURING

Rough and Finish Boring Both Main Bearings in Crankcase...in One Operation

(Below) Crankcase for single-cylinder gasoline engine, showing main bearings of different diameters and lengths of bore.

(Above) One operator maintains accuracy to ±.0005" with fine finish in production. Total boring time is 2½ minutes per piece.



(Above) Two boring bars on one spindle, with double cutting tools on each bar, rough and finish bore both diameters in one operation.

STOKERUNIT SIMPLEX *Precision* BORING MACHINE

maintains accuracy of ±.0005" with high finish

Total Actual Boring Time 2½ Minutes per Crankcase

This crankcase for a single-cylinder gasoline engine has two main bearings of different diameters and lengths of bore—one 6" in dia. with ⅜" length, and the other 3" in dia. with ⅝" length. Stock removal on the rough cut is ⅛" and on the finish cut .010". Required accuracy is ±.0005" with high finish.

To accomplish a precision boring job like this *in one operation* demands sturdily built precision boring equipment of highest operating efficiency.

On this job, the No. 2U Stokerunit Simplex Single-End Single-Spindle Precision Boring Machine meets every rigid requirement of production, accuracy and finish.

Illustration at left shows the two boring bars on one spindle, one bar for each diameter. Each bar is fitted with two tungsten carbide tools. The first tool in each set does the roughing operation on both diameters. As soon as the first tools clear the work, the second tool in each set follows for the finishing operation.

Actual boring time for all operations on both diameters is 2½ minutes; required accuracy and finish are consistently maintained. Spindle speed is 300 r.p.m.; feed ¾" per minute.

TO SOLVE YOUR PRECISION BORING PROBLEMS . . . get the complete Stokerunit story today. Over 25 models of Stokerunit Simplex Precision Boring Machines are available and cover practically the entire range of precision boring applications. They can be furnished in both mechanical and hydraulic feeds, with single or multiple spindles, for either short-run or production work.

For specific recommendations, send blueprints of parts with your production requirements. There is no obligation.

WRITE TODAY for these two booklets, which contain complete data and specifications covering the entire line of Stokerunit Simplex Precision Boring Machines.

STOKERUNIT CORPORATION

DESIGNERS AND BUILDERS OF PRECISION BORING MACHINES AND MILLING MACHINES

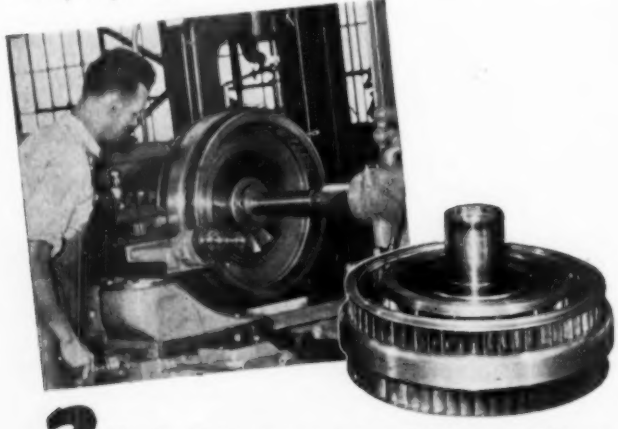
4528 WEST MITCHELL STREET • MILWAUKEE, WISCONSIN

Four ideas for the V-SHIFT

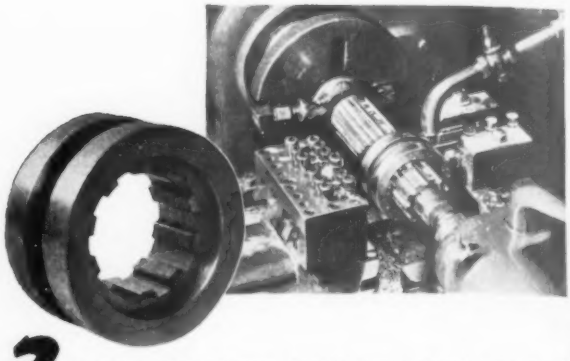
Every one of the four jobs described below took advantage of the versatility of Monarch lathes to increase production or to save waiting for new machines. If you think you can use your lathes to better advantage, perhaps we can help you. Monarch men, here at Sidney or in the field, are always at your service.

THE MONARCH MACHINE TOOL CO.
SIDNEY · · · OHIO

1 This job is being done on a Monarch lathe, instead of waiting for another machine tool. It consists of rough-turning, facing and back-facing cylinder head flanges. Work is gripped in an air chuck on a rough surface. Alignment is checked with special fixture in tailstock. Capstan handwheel permits quick movement of fixture to and from work. Tool blocks, on front and rear of cross slide, hold forming and turning tools. Front tools do part of operation, then feed is reversed in apron; slide traversed for rear tool operation, with power feed and working to automatic diameter stop. Only one setup required.



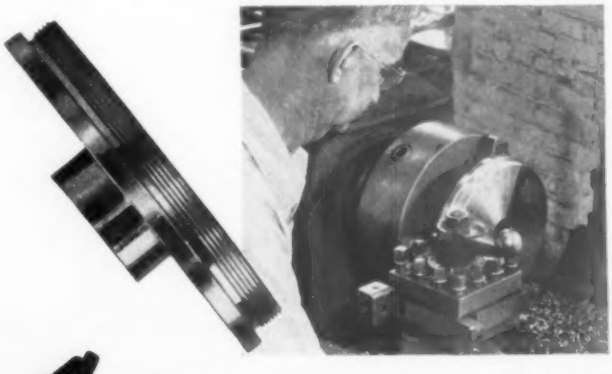
2 Months of time were saved on this job by utilizing a smaller Monarch than apparently was required. A 36" lathe was indicated, for finishing contour surfaces of aluminum housings. By raising to provide a 36½" swing, a 22" Monarch does the work, with smaller size Monarch-Keller controls. Careful job analysis saved time, saved $58,000 in first cost, and production is kept on schedule.



3 Finishing of this heavy, double-jawed clutch consists of turning OD, forming groove, straddle facing sides, necking groove diameter and chamfering 4 outside corners. It's all done in one setup on a Monarch 18" Model BB lathe, with double connected rest, tool block in front, and multiple tool block in rear. Here are the steps:

1. Press piece on spline arbor and place between centers in lathe.
2. Turn OD, using tool in rear tool rest.
3. Form groove, allowing for grind. Tool in rear rest.
4. Straddle face sides, and chamfer. Tools in front tool rest.
5. Neck diameter and sides of groove for grind relief.
6. Remove from machine and press off arbor.

Time—8 minutes per piece.



4 Another example of using machines at hand, instead of waiting for new ones. Job is to turn base plugs for bombs. The hub is turned on an older Monarch. Then, they chuck on this hub with a 3-jaw chuck, using square turret with multiple positive carriage stops and clips on cross-feed dial. Now they're ready for these operations, in one setup, on a Monarch 18" Model BB lathe:

1. Face
2. Countersink hole
3. Turn OD
4. Turn shoulder
5. Neck
6. Chamfer back edge
7. Rough thread
8. Finish thread
9. Chamfer thread

Actual machining time—5 min., 25 sec.

ARE YOU USING THE RIGHT SAW?

The new DoAll Saw Clinic takes on any sawing problem, analyzes it, finds out not only the right saw to use, but the best way to handle it, speed, coolant, etc. and gives you a detailed laboratory report.

Built for You — The Clinic is your clearing house for metal cutting jobs you want done better and faster. It's like having a laboratory in your own shop.

Up to the Minute — Equipped with the most modern apparatus, including a photomicroscope to show instantly the grain structure of metals, alloys, plymetals, castings, hard rubber, etc.

Expert Service — Manned by top ranking metallurgists and research engineers. They know their job. They can help you with yours.

All at your disposal — all without charge.

Send in your tough job now, and we'll put it through promptly and send you results.

Inconel

(79.5% nickel, 6.5% iron, 13% chromium)

Our Recommendations: Use a 14-pitch, A temper, .050 Raker set saw, ⅝" wide, at a velocity of 50 feet per min. Use colloidal graphite suspended in benzine or naphtha for coolant. A disc cutting attachment relieves operator of tedious strain.

Micarta Helmets

1/16" thick. Problem—To trim without leaving burr or rough edges.

Our Recommendations: Use a 32-pitch, A temper, .040 Raker set saw, ¼" wide, run at 1500 feet per min. By using an automatic handling fixture, 3 or 4 helmets may be sawed per minute.

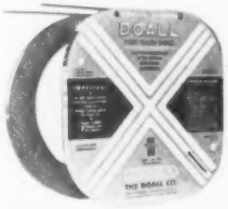
Stainless Steel Sheets

.015" thick. Layouts for 2 patterns on each sheet.

Our Recommendations: Clamp and cut 12 sheets at one time. Use an 18-pitch, A temper, .042 Raker set saw, ¼" wide run at 100 feet per minute. 24 patterns can be cut in 37.11 minutes.

DOALL Band Saws

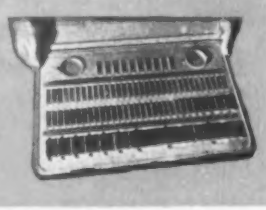
It's the extra-hardened teeth that make DoAll Saws the choice when it comes to smooth, rapid metal cutting. They slide through any kind of hard or soft material with the ease of a sharp knife slicing cheese—produce the kind of finish you can be proud of, with worth-while savings of man hours, energy and material.



Made in tempers, widths and styles to saw anything sawable. 100 feet in each Strip-out Container.

DoAll Surface Grinder

DoAll Gage Blocks

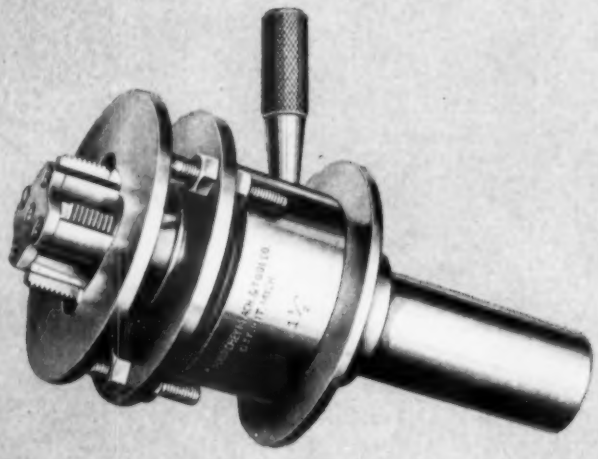


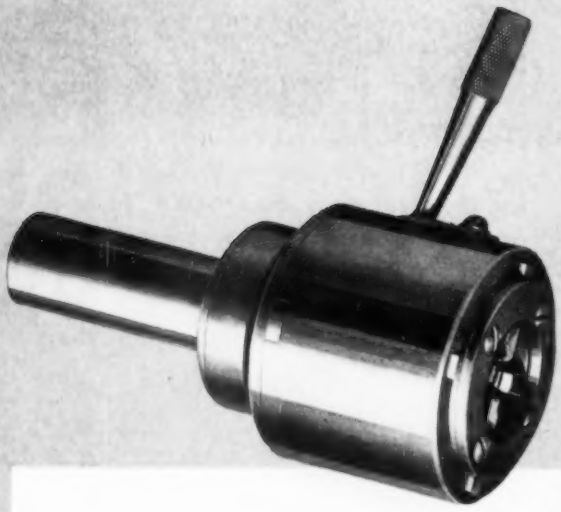
FREE SAW BOOK — Tabloid form for quick, easy reading; includes case histories of difficult jobs. Send for copy today.

THE DOALL COMPANY

1211 THACKER STREET — DES PLAINES, ILLINOIS

DoAll Offices in 25 cities, each in charge of a trained sales engineer to give you quick service on Band Saws and Files, DoAll Contour Machines, DoAll Gage Blocks and DoAll Surface Grinders





Top to bottom: Murchey Type "CO" Self-Opening Die Head . . . Murchey Type "BM" Collapsible Tap . . . Murchey Type "G" Self-Opening Die Head. At right: The Murchey No. 32 Thread Milling Machine.

DELIVERY 4 WEEKS!

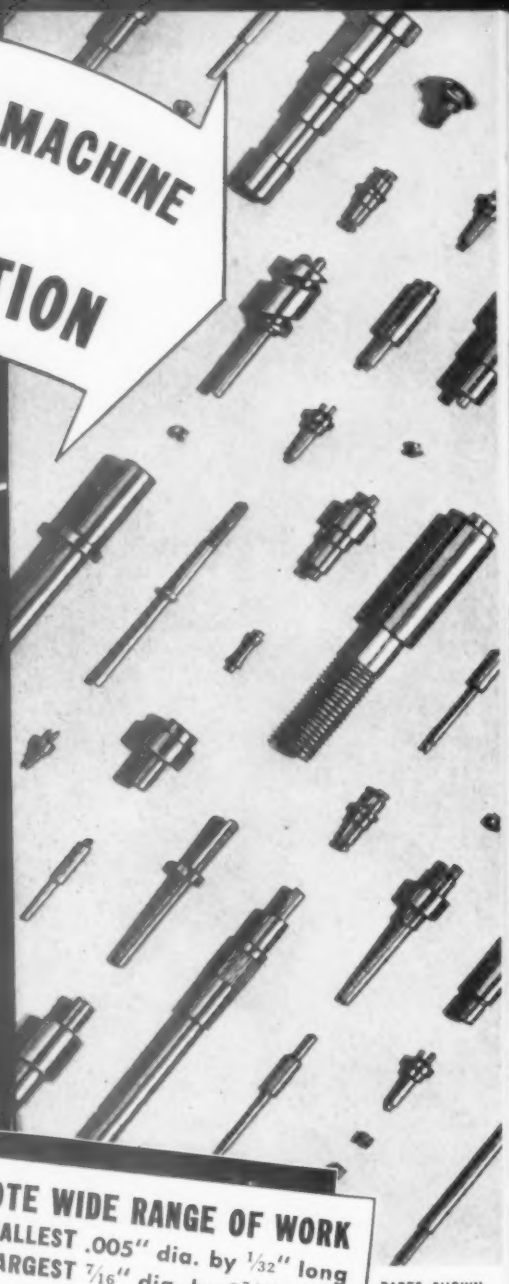
CALL DETROIT -- CHERRY 2216

Prompt delivery of Murchey Threading Equipment is as near as your telephone! We are devoting all our efforts toward improved munitions threading methods, and these Murchey Tools and Machines will help you produce accurate threads in the tremendous quantities demanded by our war effort. Call us today for help in solving your threading problems. We can give efficient telephone service at all times.

THE MURCHEY MACHINE & TOOL COMPANY

951 PORTER STREET, DETROIT, MICHIGAN

EW *Precision* AUTOMATIC SCREW MACHINE Solves Tough Jobs Like These... *Complete* – IN ONE OPERATION



Product of Two Names Famous for *Precision*

The Original Swiss PETERMANN Model P-7

Re-engineered by GORTON Improved • Modernized

NOTE WIDE RANGE OF WORK
SMALLEST .005" dia. by 1/32" long
LARGEST 7/16" dia. by 2¾" long

PARTS SHOWN ACTUAL SIZE

GORTON ANNOUNCES a new, more versatile Precision Automatic—the Model 16-A Screw Machine. Built to meet America's emergency and post-war critical needs for mass production of extremely small, intricate parts. Long, slender pieces—multiple diameters are finely finished to closer tolerances, in one operation. Unique design offers almost limitless scope in generating any shapes. Present deliveries, 6 to 8 weeks.

Exceptional ACCURACY AND QUALITY OF FINISH

High diametrical accuracy—work rigidly supported at point of cutting tool load. Unusually high finish—grinding often eliminated.

LOW TOOL AND OPERATING COST...

Maximum accessibility for quick set-ups. Uses only standard single point tool bits. Micrometer adjustments on every tool. Centralized controls—infinitely variable speeds and cam feeds at touch of dials.

LONG LIFE OF PRECISION PERFORMANCE...

Slow movements—short stroke—freedom from vibration.

GOLDEN NIVERSARY
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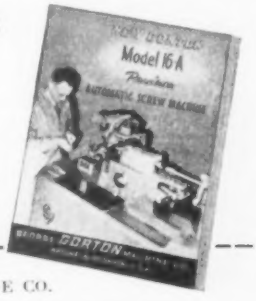
GET THE FACTS NOW

Write Today for FREE Bulletin



MAIL TODAY

GEORGE GORTON MACHINE CO.
1322 Racine St., Racine, Wis.

Send me, without obligation, FREE bulletin with complete information covering the Gorton 16-A Precision Automatic.

Name..... Title.....

Company.....

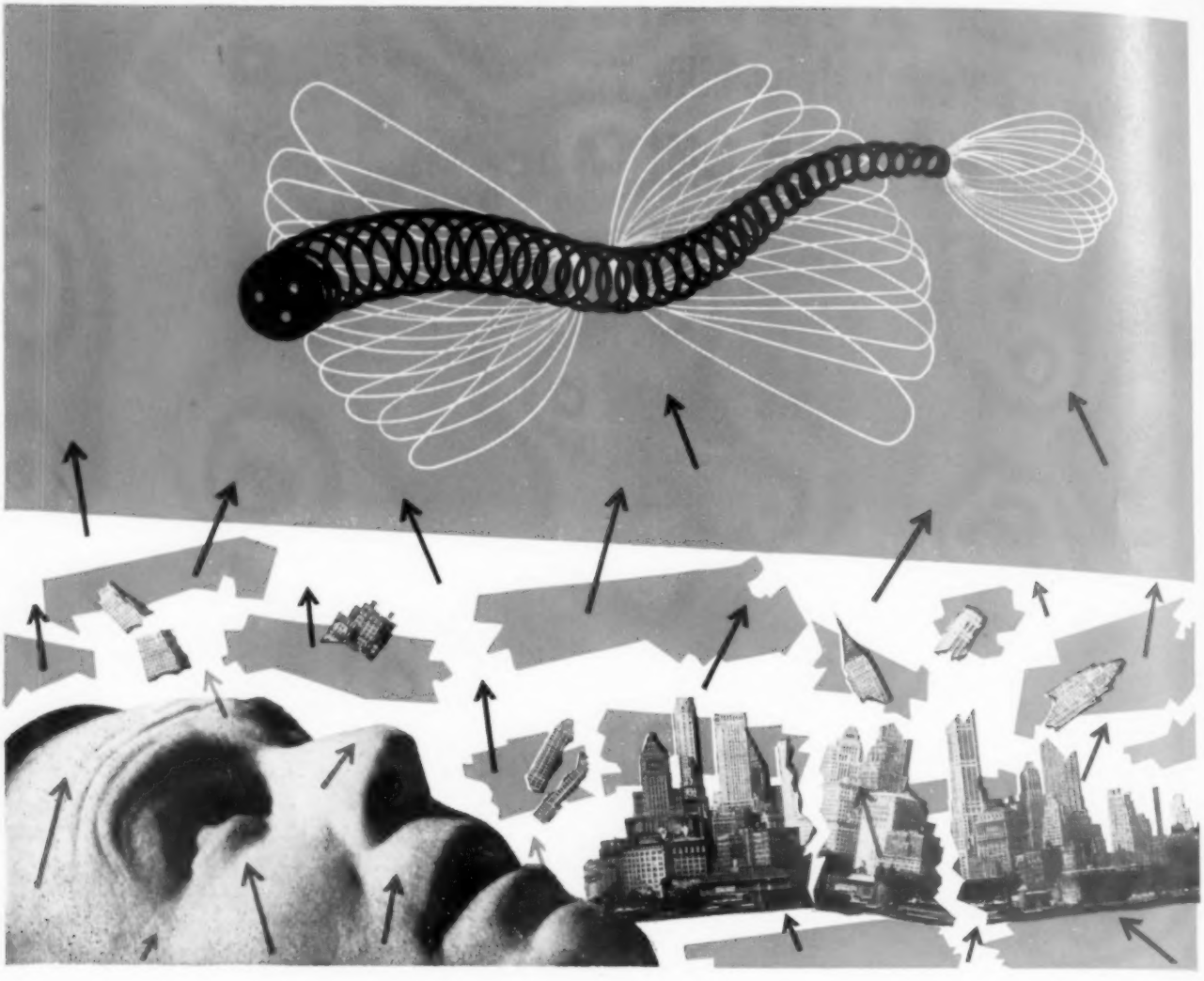
Address.....

City..... State.....

GEORGE GORTON MACHINE CO.

1322 RACINE STREET, RACINE, WISCONSIN, U. S. A.

SPECIALISTS FOR 50 YEARS IN REPRODUCING FROM MASTERS—ENGRAVING, DIE MAKING, VERTICAL MILLING MACHINES



If worms had wings . . .

IF WORMS HAD WINGS, chances are our entire economy would collapse! All because their specialty—that of swallowing earth—is unique and indispensable!

The earthworms in a single acre of ground carry more than 18 tons of earthy castings to the surface in a year! Thus, by constant plowing, they make it possible for air, moisture and life-giving minerals to circulate . . . and so for all plant-life to flourish!

But if worms had wings, they'd never be satisfied with so plebeian an occupation as burrowing. They'd just fly around. And in the meantime, the whole world would go to pot.

The moral is plain: Specialization is of so great importance that our modern world could not survive without it. Our democracy could not fight without it. Take machine tool production. We have overcome Germany's 7-year head start in about a year, and are even now outproducing the Reich in machine tools in the ratio of 5 to 1.

A potent factor in this production miracle has been the multiple spindle automatic lathe made by Cone. These titans of the machine tool industry are currently used in the production of so many different munition parts it would be difficult to list them all.

Remember that name—Cone Multiple Spindle Lathe. It will continue to make history after victory is won!

CONE Automatic Machine Company, Inc., Windsor, Vermont

Hard for a Tough Job

Again Jarvis is leading the field in introducing a new ground-from-the-solid Rotary File which is furnished with the Jarvis Hy-speed Case, increasing the life of the tool an average of three times and better — and at no extra cost. All new Jarvis ground-from-the-solid Rotary Files, as well as all Hy-speed Steel Rotary Files reground by Jarvis, are furnished with life prolonging Hy-speed Case.

Jarvis POWER TOOLS

THE CHARLES L. JARVIS CO., MIDDLETOWN, CONN.

TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES

34.3% Saving in Machining Time

44 MINUTES SAVED ON PRODUCTION OF TANK PART

This aluminum Tank Drive Housing was formerly machined on a horizontal bar type machine. Operations include boring oil seals, chamfer bearing shoulders, bore for shoulders, and bore shoulder on oil seals. With the installation of W. F. and John Barnes two-way boring machine the time has been reduced from 128 to 84 minutes per part.

Cast-iron inserts in the aluminum Tank Drive Housing are bored simultaneously with the steel bearing caps. Two of the three bores on each side are of different diameters and are bored by inserting tool blocks into the boring bars after passing the bars through the housing. Direction of feed is reversed in boring these two diameters. Spindle heads are provided with three speeds.

BORE SIZE IS HELD TO ± .0005", while depths are held to ± .005" and ± .001" with a high degree of finish. The operations are identical on both sides of the housing and boring is done from two ends simultaneously.

This is another example of how W. F. and John Barnes special machines increase production. Perhaps you can save time in a similar way . . . our engineers will be glad to help.

Customer Improves Delivery by Designing and Building Fixture

This tank manufacturer used his own facilities to help speed delivery of his machine. While we manufactured the basic machine he designed and built an ingenious, yet simple fixture. If you have similar design and manufacturing capacity in your plant, and need quick machine delivery, our engineers will be pleased to work with you in a similar manner.

IS YOUR PRODUCT LISTED HERE?

If you are manufacturing any of the following products it may pay you to investigate the possibilities of W. F. and John Barnes Engineering Service in designing and building machines to suit your part and production.

Automobiles — Airplanes
Air Conditioning
Guns and Armaments
Pencil Sharpeners
R. R. Equipment
Pipe and Fittings
Tractors — Trucks
Washing Machines
Oil Drilling Equipment
Hydraulic Equipment

W.F.&JOHN BARNES

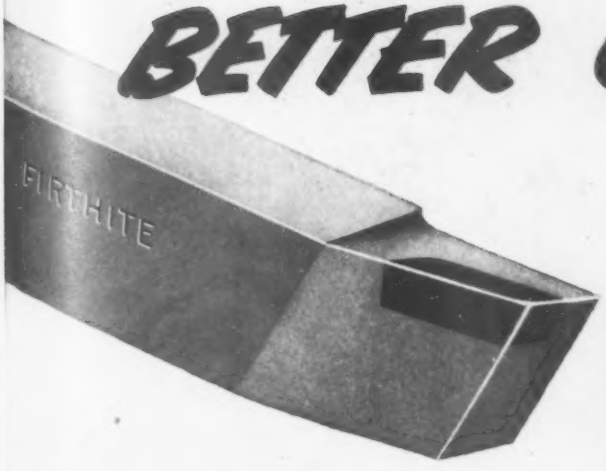
FREE PRODUCTION AND TOOLING IDEAS

Not a catalog, but a set of eight bulletins describing a better way to get better machines. Each bulletin traces a machining problem from the original study of the part to the final machine design. Each may suggest a tooling or production set-up that you can use today — valuable file information for tomorrow. Write for bulletins A-30 through A-38.

W. F. and JOHN BARNES

325 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.

FOR BETTER CUTTING



Switch to

THESE FIRTHITE GRADES
FOR BETTER CUTTING
AND TO SAVE
SCARCE TANTALUM

FOR STEEL CUTTING—These FIRTHITE Tungsten-Titanium Carbide grades stay sharp longer, cut faster, and make smoothest finish. They are described in FIRTHITE Price List FE-105 . . . or, a FIRTHITE Engineer will gladly discuss them in your plant.

FIRTHITE

TITANIUM GRADES FIT "WAR" NEEDS

T-04 - HEAVY DUTY
(CONTAINS NO TANTALUM)

FIRTHITE T-04—for coarse feeds, heavy and interrupted roughing cuts. Closest approach to a **universal grade.**

TA - GENERAL PURPOSE
(CONTAINS NO TANTALUM)

FIRTHITE TA—for general-purpose cutting tools on **all** types of **steel** in high-speed production.

T-16 - FAST FINISHING
(CONTAINS NO TANTALUM)

FIRTHITE T-16—for light, rapid finishing of **harder** steel, shells, etc.

T-31 - PRECISION WORK
(CONTAINS NO TANTALUM)

FIRTHITE T-31—for lightest, fastest, shallow cuts. Recommended for **precision** boring, etc.

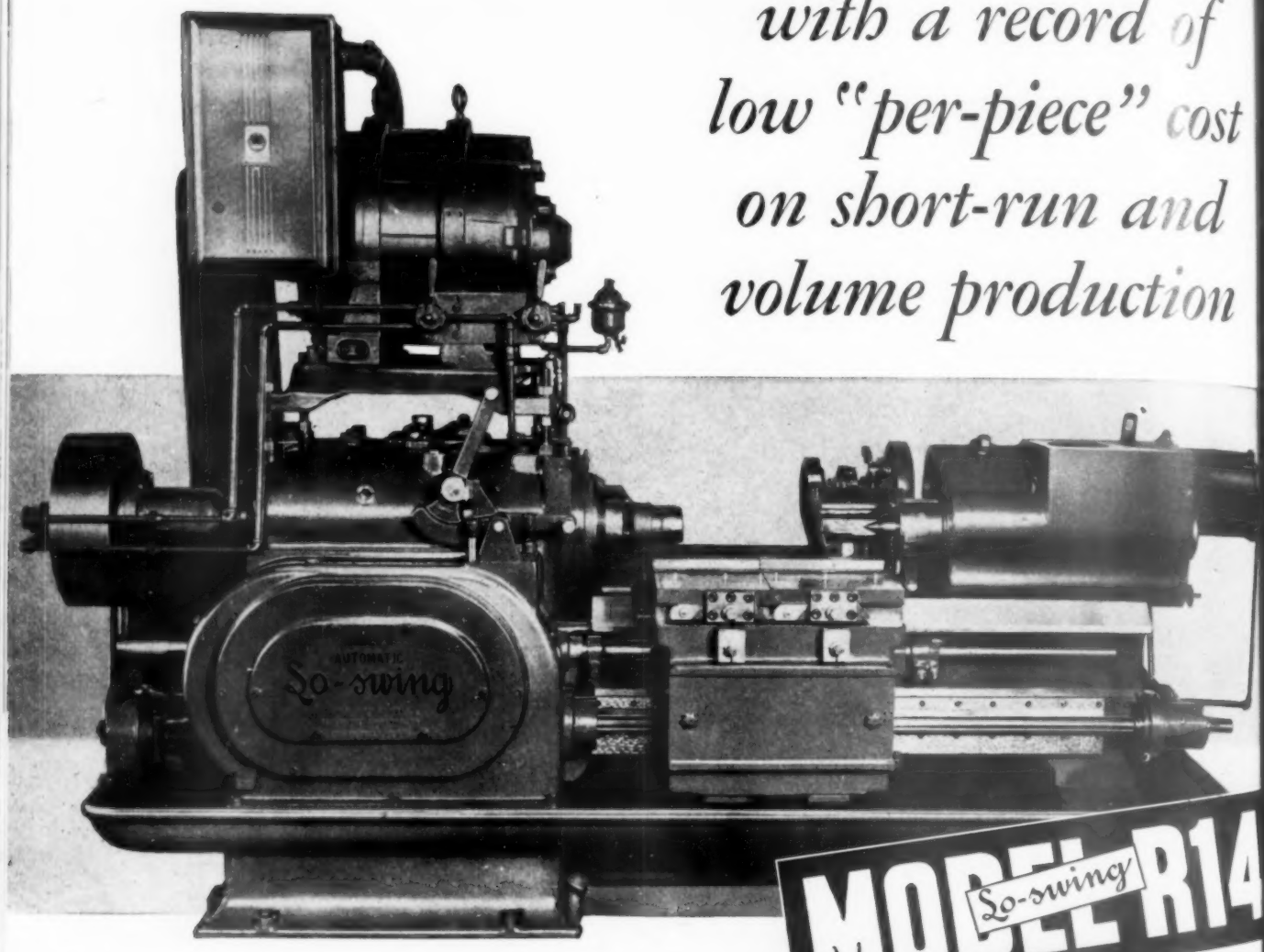
Firth-Sterling
STEEL COMPANY

Offices: McKEESPORT, PA. - NEW YORK - HARTFORD - PHILADELPHIA - CLEVELAND - DAYTON - DETROIT - CHICAGO - LOS ANGELES

FIRTHITE TUNGSTEN-TITANIUM CARBIDES

A BIG, POWERFUL, AUTOMATIC LATH

with a record of low "per-piece" cost on short-run and volume production



MODEL R14 Lo-swing

A BIG, powerful Automatic suitable for armament, aircraft, truck and tractor work because it provides the power, rigidity and tool support necessary for heavy multiple tool turning. Model R-14 incorporates the Seneca Falls Simplified Change-Over Mechanism, making change-over from job to job merely a matter of a few minutes' adjustment. Length of carriage stroke and rapid traverse adjustment may be varied without changing any cam.

Positive operation, wide flexibility and servicing simplicity are important advantages of this design. Model R-14 may be equipped with a third arm (overhead) as well as additional back squaring attachments, carriages, carriage slides and work handling devices.

This lathe is being used for turning aircraft motor cylinders, heavy tank parts, aircraft landing struts, heavy projectiles and other war work.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

Close-up view of a Model R-14 tooled to automatically turn, groove and face special alloy pistons of 10.5" diameter.

LATHE NEWS from SENECA FALLS

Aid on wartime tool steel problems

Top speed war production demands TOOLS — *more* tools than dreamed of in peace time — *new kinds* of tools for new war time jobs. The tool industry is tackling this tremendous task short of skilled tool makers and restricted by shortages in their choice of steels.

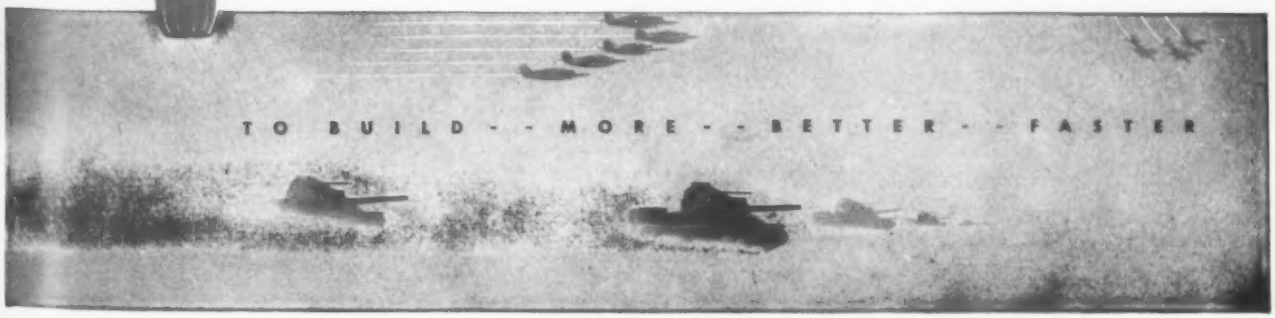
Solutions to these new problems are being worked out every day by the tool industry. Frankly, we don't have all the answers but our contacts with American tool makers determined to win this war puts us in a position to assist you in finding solutions to some of the particular problems that may be facing you.

On your problems of steel selection and treatment of tool steels, we would be very glad to have you get in touch with us. For your convenience, we are listing below the addresses of our district offices.

COPPERWELD STEEL COMPANY · WARREN, OHIO

COPPCO TOOL STEELS

BUFFALO	1127 Liberty Bank Building	Washington 7283
CHICAGO	122 S. Michigan Avenue	Harrison 1411
CLEVELAND	1158 Union Commerce Building	Cherry 1326
DETROIT	7-251 General Motors Building	Trinity 1-1760
NEW YORK	117 Liberty Street	Cortlandt 7-8314



Your I. S. D.* may have ordered on high priority *Last Month!*

Your Purchasing Department may be short-handed. Your Expeditors may be run ragged. But your *Industrial Supply Distributor is on the job—capable as ever, ready to help. *Are you using him enough?*

He knows what you need—the whole range from grommets to forge hammers. He knows where he can get them—he has many sources of supply. He buys more often than not on high priority. He orders in big lots—as often as he can, and as much as he can get. He buys for stock—in normal times he carries as many as 25,000 to 50,000 individual items.

It will pay you always to inquire of your Industrial Supply Distributor before you send directly to the factory—he may have anticipated you by ordering last month or the month before the very things you need tomorrow. Thus you avoid duplication, confusion, scattered effort. Telephone your Distributor FIRST! And save yourself both time and expense.

Your Distributor is your dependable supplier of Cle-Forge High Speed Drills, Peerless High Speed Reamers, and other cutting tools that we manufacture.

TRADE MARK REG. U.S. PAT. OFF.

ARMY NAVY

ARMY E NAVY

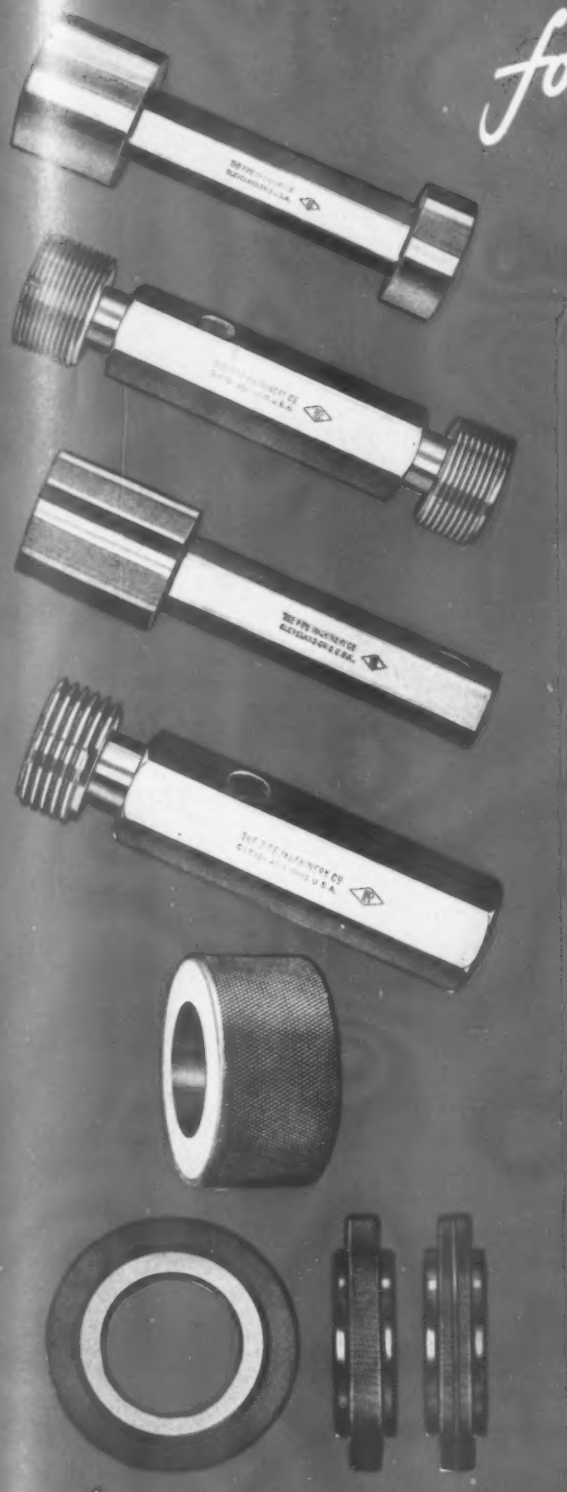
The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

30 READE ST. NEW YORK · 9 NORTH JEFFERSON ST. CHICAGO · 650 HOWARD ST. SAN FRANCISCO
6515 SECOND BLVD., DETROIT · LONDON - E. P. BARRUS, LTD. - 35-36-37 UPPER THAMES ST., E.C.4

GAGES

for Delivery TODAY!



AS a service to industry, this company maintains a substantial inventory of standard gages in a wide variety of types and sizes, from which immediate deliveries can be made.

Because demands on this stock are variable, we cannot always guarantee to ship at once every size and type, but you may always be sure of getting prompt shipment of most standard gages.

Standard Thread, Plug and Ring Gages in sizes No. 5 to 1½", as well as minor diameter plain plugs, are carried in stock. Other sizes and types made on special order.

Remember that all gages bearing the PM Diamond Emblem are of extreme accuracy and careful finish. The emblem is your guarantee that these gages provide safe and sure production controls of dimensions for precision and manufacture.

We suggest frequent reference to your Pipe Machinery Gage and Small Tool Manual. You will find it a big help in these days of tight production schedules. If you do not have a copy, we'll gladly send you one on request.

PM CO

ARMY NAVY

The PIPE MACHINERY COMPANY Cleveland, O.

GAGES · HOBS · MILLING CUTTERS · SPECIAL TOOLS

"CLETRAC" PARTS HARDENED BY TOCCO

SAE 1045 Steel Surface-Hardened to 60-62 R.C.

Part	Former Material	Production Per Hour
Sprocket	SAE 1045	15
Track Pin (Small)	X 1020*	550
Track Pin (Large)	X 1020*	400
Bracket Plunger	5120*	100
Shift Shaft	5120*	150
Ring Gear	Y 1340	60
Lock Pawl	5120*	120
Pivot Shaft	X 1020*	100
Link Pin	X 1020*	100
Rocker Arm Shaft	X 1020*	100

*Carburized

TOCCO TRIPLES OUTPUT OF 10 "CLETRAC" PARTS

THE Cleveland Tractor Company, manufacturer of well-known "Cletrac" military, industrial and farm tractors, cites these benefits of hardening parts with a 100 KW "TOCCO Jr.":

Greater Output. Average production speed now three times that of former hardening methods. Elimination of carburizing has cut hardening cycles on most parts from 8 hours to a few seconds.

Versatile. 10 widely different "Cletrac" parts—from 28" sprockets to ¼" link pins are hardened on one "TOCCO Jr." New applications being developed continually with the aid of TOCCO engineers.

Lower Costs. Cuts man-hours. Eliminates expensive plating, carburizing and straightening operations. Replaces scarce alloys with carbon steels. Simple to operate, doesn't require skilled operators.

"TOCCO Jr." equipment is built for continuous production service. Dependable, rugged motor-generator supplies power at a safe, low voltage.

Find out how TOCCO can improve your war production and enable you *to cut costs and improve your products for postwar markets.*

THE OHIO CRANKSHAFT COMPANY
Cleveland, Ohio

TOCCO

World's Fastest, Most Accurate Heat-Treating Process

HARDENING ANNEALING BRAZING HEATING for forming and forging

THE GENERAL MANAGER ASKED:

"Why change to Ozalid Whiteprints?"

YOU CAN COUNT ON the General Manager firing a line of questions when radical changes are suggested.

Here are three questions frequently asked by hard-thinking, hard-boiled executives when the engineering department requisitions an Ozalid Whiteprint Machine. And here are some sound reasons why so many have been convinced of Ozalid's superiority over old-fashioned print-making methods.

Q. ***What's wrong with our present equipment?***

A. Compare with Ozalid's. An Ozalid machine turns out whiteprints of engineering drawings, charts, letters in two fast steps—EXPOSURE and DRY DEVELOPMENT. There are no liquid baths, no plumbing connections, no solutions to mix. A score of other maintenance headaches have also been eliminated.

And, an Ozalid Whiteprint Machine is so clean and compact . . . it may be installed right in the drafting room. Anyone can operate it at top efficiency.

Q. ***Why is the Ozalid Process the most versatile?***

A. You can do so much more! (a) You can make prints having black, blue, or maroon lines on a white background. The maroon line is recommended for the shop since it shows the greatest contrast to grease and dirt . . . and will stand up better than the white line of a blueprint. (b) You make duplicate originals the same way you produce standard prints —without Van Dyke tieups. (c) You can use cut sheets as well as roll stock in an Ozalid machine. Thus, you can completely eliminate trimming waste by using sheets the size of your tracings.

Q. ***How can Ozalid save a thousand hours in our drafting room?***

A. Give a draftsman an Ozalid duplicate of a tracing which you want changed in part. He'll have a "new" original in a fraction of the time required with other methods. First, he eradicates the obsolete lines with Ozalid Corrector Fluid. Then he draws in the new design. It's that easy! It's *never* necessary to redraw any line which remains the same as in the original.

Think of the changes you're making in your products today. Think of the changes you'll be making in the post-war period. By installing an Ozalid Whiteprint Machine—you'll be sure of a "head start."

OZALID PRODUCTS DIVISION

GENERAL ANILINE AND FILM CORP.

Johnson City, N. Y.

Write for "Simplified Printmaking." It shows how leading manufacturers save time, labor, and materials with the Ozalid Process.

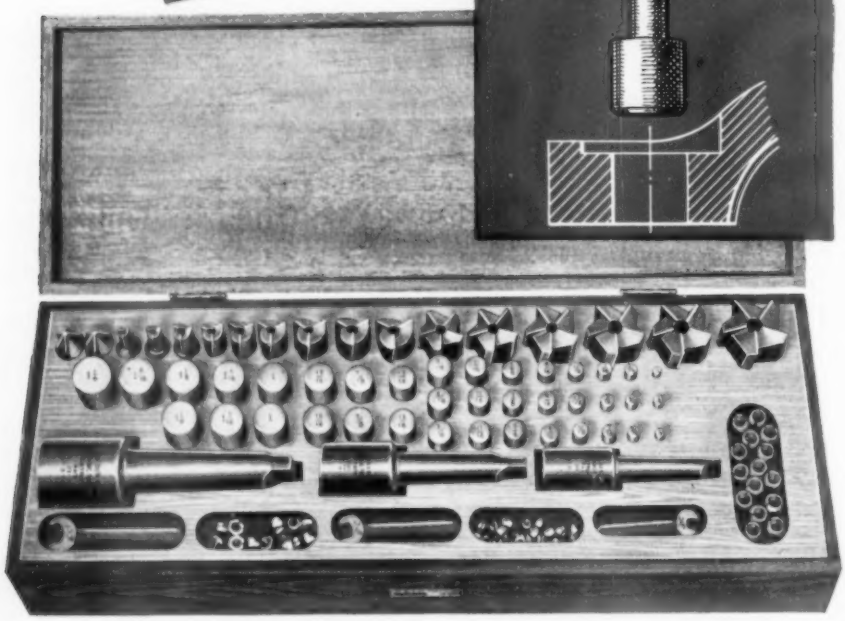
Today's production program demands accurate, efficient cutting tools **within easy reach.** Gairing standard kits (particularly recommended for tool rooms, machine, die and repair shops) provide the answer for all counterboring, countersinking and spot-facing operations.

There are seven sets from which to choose. Set B-4 is illustrated here. Each contains tools designed with special features to meet different requirements—each is a logical assortment of **interchangeable** counterbores, pilots and holders neatly boxed in sturdy wooden cases with stout hinged covers.

FIRST AID FOR THE TOOL ROOM

Write us today for our four-page Counterbore Bulletin illustrating, describing and pricing all seven sets.

Gairing TOOLS



The **interchangeable** holders in these sets are of Morse Taper or straight shank type. (Optional.) Threaded shank pilots are of selected alloy steel hardened and ground on the head. Shanks are drawn and treated to obtain unusual toughness and strength. High speed steel counterbores are renewable. The use of these **interchangeable assemblies** assures large savings over the old fashioned solid integral pilot type.

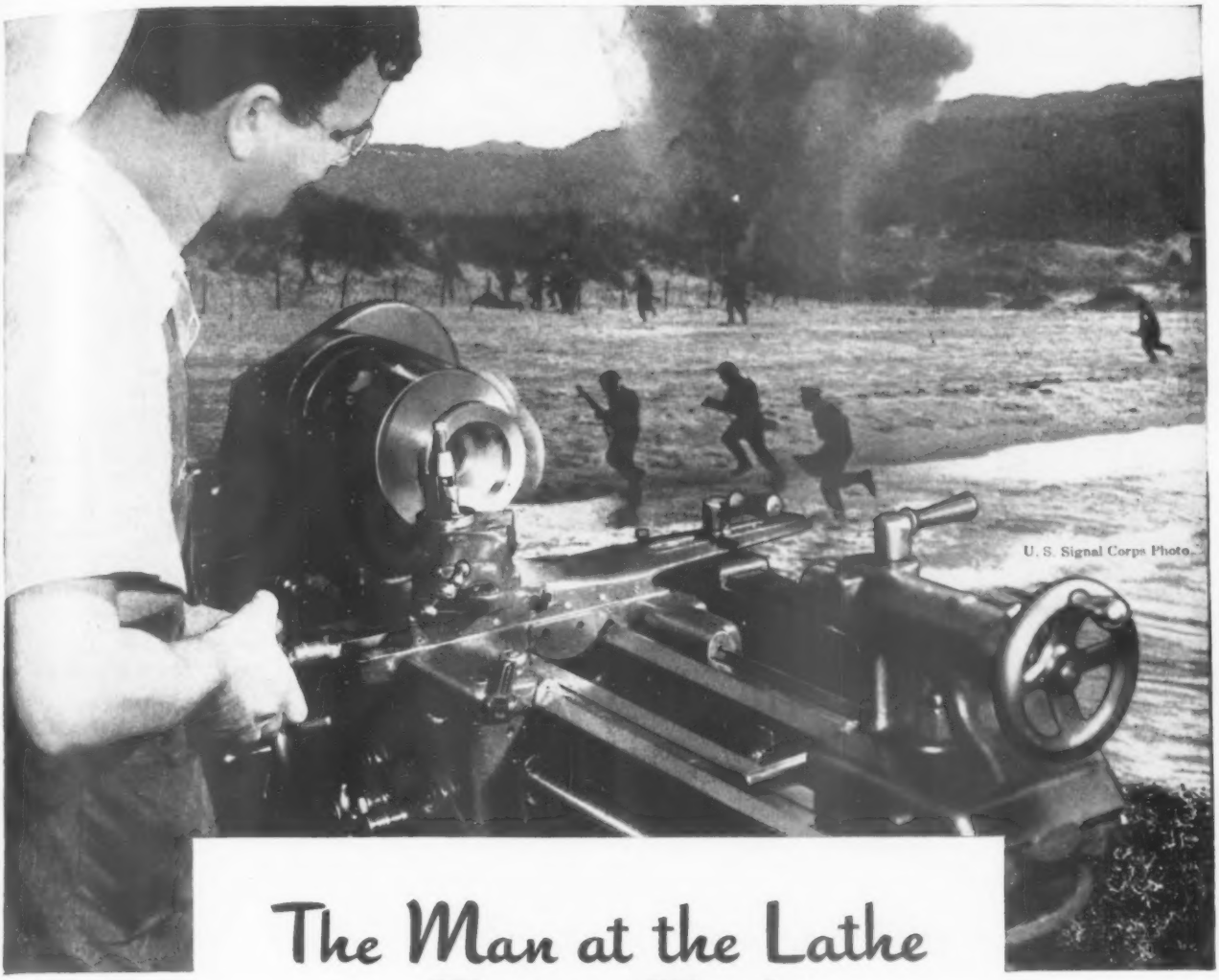
All counterbores, pilots and holders selected are standard items of the most active sizes used. Replacements may be quickly obtained from stock.

Gairing Interchangeable Counterbore Set No. B-4

GAIRING
FOR OVER A QUARTER CENTURY SPECIALISTS IN FINE CUTTING TOOLS

THE GAIRING TOOL COMPANY, Detroit, Michigan

Manufacturers of Standard, Special and Gair-Lock Inserted Blade Cutting Tools



The Man at the Lathe Fights Too!

...and every turn of the spindle, as he guides his work through many precision operations, helps bring Victory one step closer.

Hours spent at a lathe may lack the dangerous excitement of combat—but the valorous men on the battle fronts breathe a prayer of thankfulness for guns, shells, planes, tanks—for all the superb equipment which is helping them swing the tide against the Axis.

So the man at the lathe is a soldier, too, as he bends his shoulders to the task of pouring out weapons in an ever-increasing stream. He faces his task grimly... proudly... proclaiming by the gleam in his eye and the jut of his jaw that he will not be outdone in service to his country, and knowing that America's production is a decisive factor in the war.

To help America "tool up for Victory," the output of South Bend Lathes has been increased (we can't say how much) in the last year and a half—giving the man at the lathe the efficient, dependable production weapon he must have to win.

There is a South Bend Lathe for every class of work—engine lathes, toolroom lathes, and turret lathes. Write now for our new catalog No. 100B in which the entire line is illustrated and described.

SOUTH BEND LATHE WORKS

LATHE BUILDERS FOR 36 YEARS

SOUTH BEND, INDIANA

One Person BUCKS AND RIVETS

AERO TOOL PORTABLE AUTOMATIC BUCKER

SPECIFICATIONS

APPLICATION—To buck rivets automatically.

FEATURES—Releases one operator. Air cushioned Bucking Head gives operation superior to manually held bar. Perfect alignment of Bucking Bar and Rivet Set is always assured. When Rivet Set contacts rivet, Bucker is always against shank. Adaptable to work where long throat is required.

CONSTRUCTION AND MATERIALS—Gun clamp and Bucking Head of cast steel. Yoke of heavy tubular steel with brace incorporated. Aero Tool Portable Automatic Bucker operates with pistol type gun.

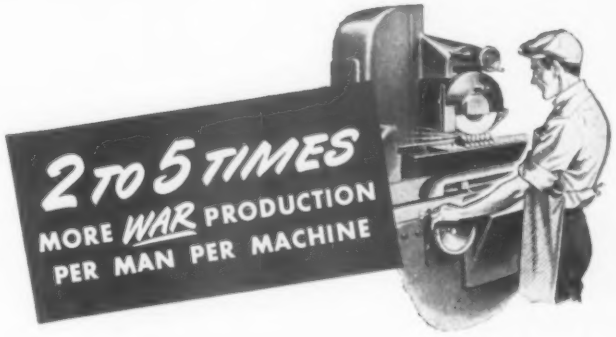
SIZES—Aero Tool Standard Portable Automatic Bucker weighs 14 lbs. and has 22" throat. Larger sizes manufactured to specifications at additional charge. Standard Rivet Sets and Standard Squeezer Sets are used in all operations. Note: A treadle operated bench model is also available.

ORDERING INSTRUCTIONS—When ordering, ask for Aero Tool Portable Automatic Bucker and specify rivet size and whether desired with or without gun.

AERO TOOL CO.
CUPFORGED AVIATION TOOLS

233 WEST OLIVE AVENUE, BURBANK, CALIFORNIA • CABLE ADDRESS AERO

IMPORTANT NOTICE TO WAR PLANTS CONCERNING POR-OS-WAY DELIVERIES



WE MUST BE FRANK. When we first announced the Por-os-way precision grinding wheel a little more than a year ago, we were ready with a plant far exceeding our previous one in size, equipment and man-power. It was, we felt, big enough to meet all demands. But two things have happened. First, the war. Then Por-os-way, making good its promise to increase grinding production 2 to 5 times per man per machine, has literally sky-rocketed in demand. Hundreds of grinder foremen and grinding machine operators want to prove Por-os-way can up production 2 to 5 times for them, want to see what makes it different from other wheels, how its cool action practically eliminates burning, how it takes cuts double or more than previous wheels and grinds in fewer passes, how it can cut faster producing an even *better finish using a finer grain*, why it resists loading, holds its corner, reduces dressings necessary.

ORDERS INCREASED 700%

Orders have poured in. Not at a steady pace but at an ever increasing rate. Our production is now forging ahead—yet is still not enough to satisfy the full demand for Por-os-way.

RELIEF IS IN SIGHT

Working 'round the clock was not enough. We needed more plant, more equipment, more men. Work on expanding our facilities is now completed. Greatly increased production is now under way. Again we believe it will be amply big enough to take care of all your demands. Naturally we want every war plant to know the exceptional advantages of Por-os-way wheels. And so, we're doing all we humanly can to keep up on delivery. In the meantime, write A. P. de Sanno & Son, Inc., 462 Wheatland Street, Phoenixville, Penna. for a booklet "Facts About Por-os-way". It gives a complete story.

POR-OS-WAY* *a new* RADIAC* PRODUCT

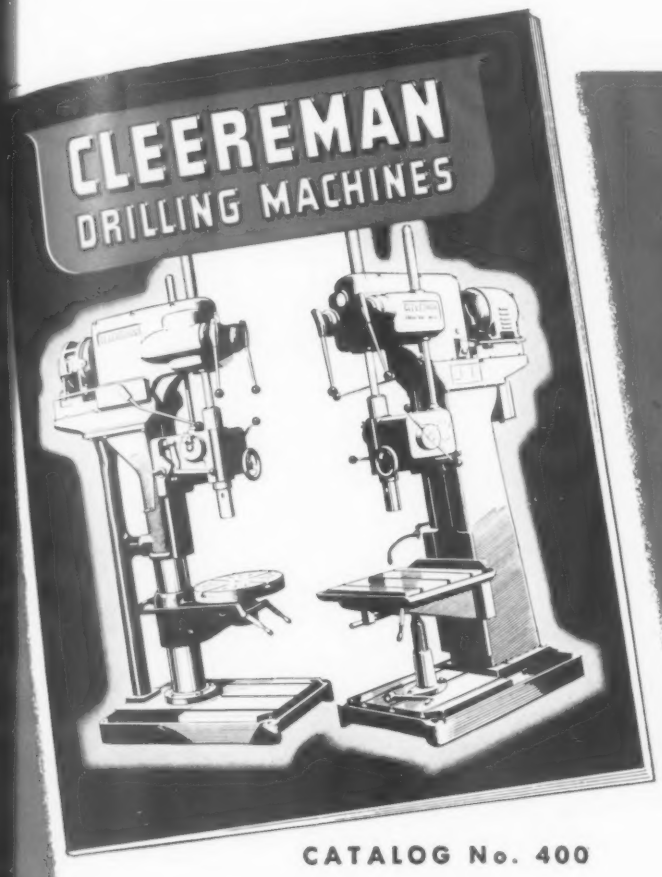
A. P. DE SANNO & SON, INC.
NEW YORK, CHICAGO, PITTSBURGH, CLEVELAND, DETROIT, LOS ANGELES

PHOENIXVILLE, PENNA.
Western Gateway to VALLEY FORGE

*T. M. Reg. U. S. Pat. Off.

NEW! CLEEREMAN CATALOGS

WRITE FOR YOUR COPIES TODAY!



CATALOG No. 400

CLEEREMAN DRILLING MACHINES

For high-speed drilling, boring, and tapping. Sliding head, round and box column types, in 21", 25", and 30" sizes. Wide range of speeds for drilling or boring 3/16" to 6" holes at proper peripheral velocity of tool.

CATALOG No. 300

CLEEREMAN JIG BORERS

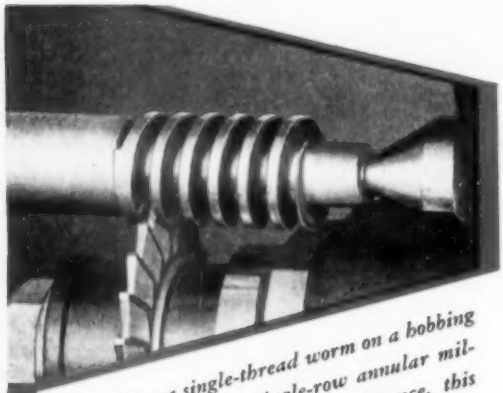
Constructed for extremely accurate production of jigs, tools, fixtures, dies, gauges, and precision machines. Extensively used for low-cost, small-quantity production of parts without the use of jigs and fixtures.

Cleereman now flies the Army-Navy "E" Flag

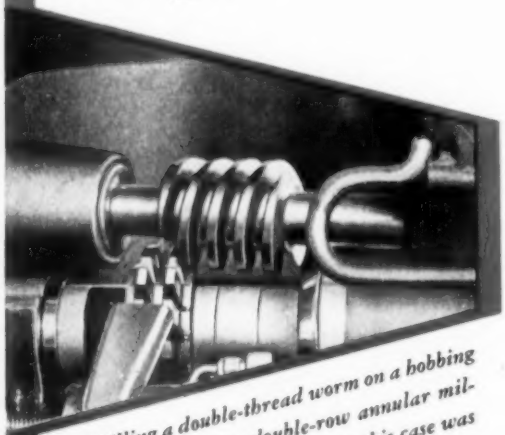
BRYANT MACHINERY & ENGINEERING COMPANY

Associated with **CLEEREMAN MACHINE TOOL COMPANY**

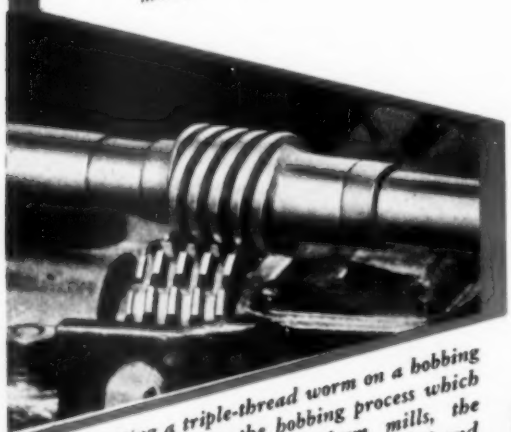
General Sales Offices 400 W. Madison St. • • Chicago • Ill. • U.S.A.



Milling a single-thread worm on a hobbing machine, using a single-row annular milling cutter. To avoid interference, this cutter is mounted on a stub arbor.



Milling a double-thread worm on a hobbing machine, using a double-row annular milling cutter. The bob swivel in this case was modified to provide needed clearance.



Cutting a triple-thread worm on a hobbing machine, using the hobbing process which generates, rather than form mills, the threads. A 90-degree spindle is used and the hob has tapered teeth on one end.

Barber-Colman HOBBING MACHINES *can be used for* THREAD MILLING

THE process of milling worm threads requires a slow-turning work spindle and a cutter spindle which can be set at an angle to correspond with the helex of the thread. The cutter is fed at a rate of exactly one pitch per revolution of the work. Barber-Colman Hobbing Machines can be easily set up to accomplish these actions. Carriage feed and work rotation are synchronized through a gear train having a wide range of adjustments. Cutter speed is determined by a separate set of change gears. In this way, the advantages of accuracy and production inherent to the hobbing process can be used for thread milling. In some instances, owners of hobbing machines may thus use them for producing worms and other threaded pieces instead of using a special machine.

A FEW LIMITATIONS...

When a hobbing machine is set up for thread milling, the cutter spindle is necessarily swivelled so that it is nearly parallel to the work spindle. The work may be such that this will introduce interference between the bearings or gear case of the hob spindle and other parts of the machine. These can usually be avoided by special work-holding means, or by using a 90 degree attachment on the hob spindle. The milling process is used on single and double thread worms; most pieces with three or more threads are hobbed. Our engineers will be glad to work with you on your worm milling problems.

See "HOBBING NOTES"

The subject of worm thread milling on a hobbing machine was comprehensively covered in an article which appeared in Barber-Colman *Hobbing Notes* for March, 1939. We suggest you look up this discussion for further details.

Buy War Bonds

BARBER B-C COLMAN PRODUCTS

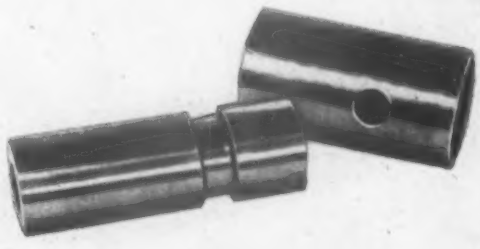
HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

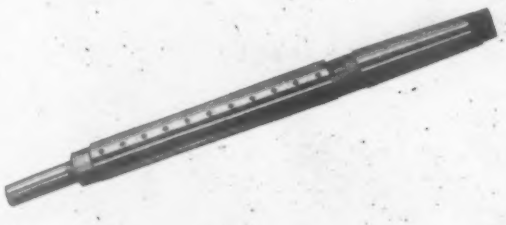
GENERAL OFFICES AND PLANT • 213 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

Forestall Replacement Problems!

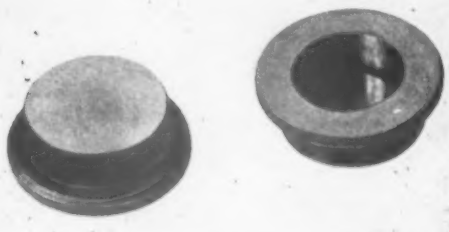
These 2¼-in. long plunger lever pins for diesel engines are cast of Haynes Stellite alloy and finished by grinding to accurate dimensions.



This 2-in. O. D. piston and cylinder, for use in a die casting machine, are made of Haynes Stellite alloy to withstand abrasion, heat, and corrosion.



Haynes Stellite wear strips on boring, driving, and pilot bars keep them accurately aligned, eliminate galling, and reduce maintenance.



These Haynes Stellite valve stem caps for diesel engines are used to combat severe conditions of abrasion and heat.

use Haynes Stellite Alloy Parts to resist

ABRASION . . . HEAT . . . CORROSION

• Machine and automotive parts which are made of Haynes Stellite alloy stand up for long periods of use even when subjected to severe abrasion, erosion, heat, or corrosion. For this reason, parts made of this wear-resistant alloy are being used increasingly at vital points to help avoid shutdowns . . . to reduce maintenance costs . . . and to forestall problems of parts replacement.

Haynes Stellite alloy specialties ranging in size and shape from phonograph needles to intricate, cored castings like the lever pins shown above are regularly made to order—cast and ground to customers' specifications. Stampings or forgings of a malleable grade are also supplied. For more information, write or phone the nearest district office—today!

Take Advantage of This Unique Combination of Properties

• Haynes Stellite alloy is inherently hard and abrasion-resistant, even at red heat.

• Haynes Stellite alloy is resistant not only to atmospheric corrosion, but also resists the action of many corrosive materials.

• Haynes Stellite alloy takes a high polish.

• Haynes Stellite alloy has a low coefficient of friction.

"Haynes Stellite" is a registered trade-mark of Haynes Stellite Company

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

. New York, N. Y. UCC Kokomo, Indiana

Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

OPERATIONS

MACHINE—Libby 1-H Heavy Duty Turret Lathe.
PART—Shell End Mill Body.
MATERIAL—3135 Alloy Steel Forging.
HOLDING METHOD—Chucking in 3 Jaw Scroll Chuck.

MACHINING SEQUENCE

FIRST SIDE
1—Rough turn 7½" O.D.—Rough face with cross slide, removing ½" stock on O.D.
2—Drill—1 15/16" hole.
3—Ream.
4—Radius on corner of body and chamfer in hole.

SECOND SIDE
1—Turn O.D.
2—Face 2d side.
3—Counterbore 10° angle.
4—Chamfer corner—burr edge of bore.

FREE *Write for catalog covering the extensive line of Libby Type H Heavy Duty Turret Lathes. Ask Libby engineers to make specific recommendations. Write to Libby Division, 1130 West 21st St., Indianapolis, Ind.*

CUTS OF 1/2" IN TOUGH ALLOY STEEL ARE COMMON WITH

LIBBY

HEAVY DUTY TURRET LATHES

A prominent cutting tool manufacturer uses a Libby 1-H Heavy Duty Turret Lathe for turning rough alloy steel forgings used as inserted blade cutter housings. Four operations are performed on each of the two sides of the cutter bodies which vary in size up to 16" in diameter. Quantities vary from 1 to 25 with about 6 to 8 of each type. Floor-to-floor time is 45 minutes on the 7½" diameter cutter.

FOR ACCURATE TURNING OF HEAVY DUTY WORK

Libby Heavy Duty Turret Lathes have been designed to perform heavy work while holding close tolerances. The micrometer feed dials, reading in thousandths, save time in holding close dimensions, both in longitudinal and cross feeding.

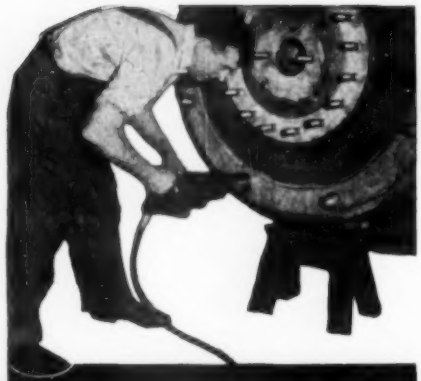
This installation is typical of the way Libby Heavy Duty Turret Lathes are being used for heavy duty turning as well as the regular run of turret lathe work.

If your turret lathe work is large or unwieldy, consult our engineers for their recommendations. Your work may require a fixed or sliding bed gap turret lathe to accommodate irregular shaped parts. It may require a conventional turret lathe with extra rigidity to handle heavy cuts. It may require a machine of sufficient stamina to handle occasional large pieces and other miscellaneous jobs. Whatever your turret lathe requirements, our complete line of heavy duty machines undoubtedly includes the size best suited to your work. Consult Libby engineers—there is no obligation.

INTERNATIONAL MACHINE TOOL CORPORATION

LIBBY DIVISION, INDIANAPOLIS, INDIANA · FOSTER DIVISION, ELKHART, INDIANA
MAIN OFFICE AT ELKHART, INDIANA

FOSTER FASTERMATICS · LIBBY HEAVY DUTY TURRET LATHES · STANDARD TOOLS
SUPERFINISHING MACHINES · BARKER CHUCKS · UNIVERSAL RAM TYPE TURRET LATHES



4 Simple Maintenance steps keep Pneumatic Wrenches on the job

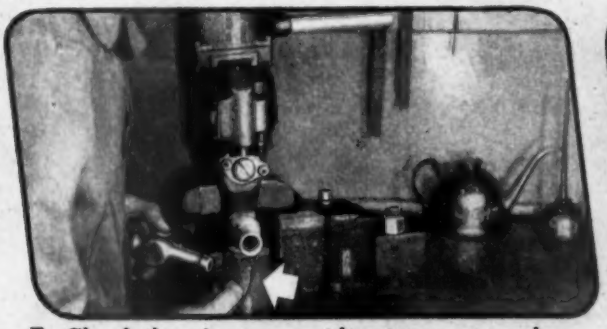
PERIODIC LUBRICATION PROPER ALIGNMENT BIG FACTORS IN IMPACT WRENCH PERFORMANCE

Because of their sturdy construction, slow motor speed and fewer parts (no springs or gears), CP Pneumatic Wrenches (impact type) give long service under severe conditions with a minimum of repairs. But, they will give even better service if they are given a little precautionary care.

Here are four simple maintenance steps for your CP 365-R Pneumatic Wrenches. Do these things regularly and you will keep your wrenches on the job, cut repair time to the minimum and conserve strategic materials.

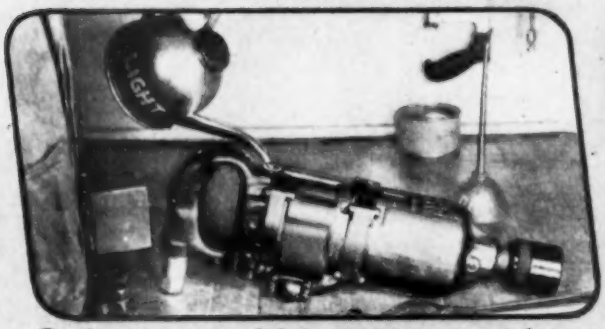
While these points apply particularly to the CP 365-R, they are applicable generally to other CP wrenches of the impact type. Detailed suggestions for the care of other models will appear in future advertisements.

HOW TO GET MAXIMUM SERVICE FROM YOUR CP 365-R PNEUMATIC WRENCH



1 Check the air screen at least once a week. Clean it with an air hose. A dusty, dirty air screen will rob your wrench of power.

2 At the beginning of every shift, check the through bolts and nuts on tool housing and motor housing. Be sure all nuts are tight.



3 Proper motor lubrication is essential to good wrench performance. Fill reservoir every day with a good grade of light oil.

4 Once each week, lubricate the 365-RP wrench with a grease gun. For the best results, use the CP Impact Wrench Grease.

★★★★★★★★★
PNEUMATIC TOOLS
ELECTRIC TOOLS
(Hicycle...Universal)
ROCK DRILLS

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York, N. Y.

★★★★★★★★★
AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES

PHOTO BY U. S. ARMY

P&J

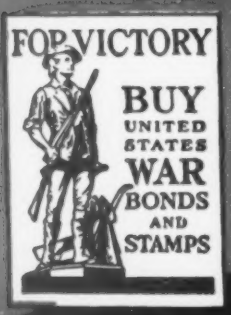
Automatic
CHUCKING EQUIPMENT
goes "all-out" to win the Battle of Production

The outstanding performance of P&J equipment can be attributed to its strength, power, versatility in tooling and operative convenience.

These features play a vital part in successfully performing the task of producing duplicate parts for weapons of all kinds at top speed and with maintained accuracy.

Airplanes, airplane engines, tanks, Bofors guns, 90 mm anti-aircraft guns, machine guns, adaptors for shells, American Oerlikon guns and other war material are coming off production lines in ever-increasing quantities because P&J machines are carrying an important part of the responsibility for producing them.

P&J engineers offer their specialized experience in parts production to help you get the maximum performance from your equipment.



The POTTER & JOHNSTON MACHINE COMPANY

Pawtucket, R. I.

Contribute your "ALL" NOW in the "ALL-OUT" to win quickly

BUY MORE WAR BONDS

CHATTERLESS COUNTERSINKS

BANISH CHATTER BY USING A SHEARING CUT

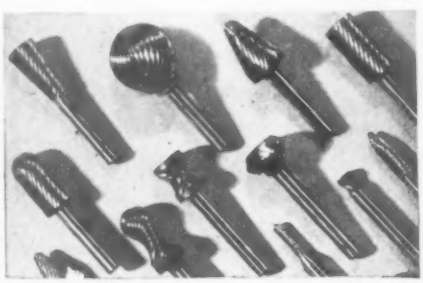
Because of their unusual design, Severance chatterless countersinks have proven to be remarkably efficient tools for a wide variety of production and job work. They take an unusually heavy, shearing cut, they eliminate chatter, and they leave a good, smooth seat. Severance Countersinks are available in various combinations of angles, shanks, diameters and lengths. Ballnose, and double-angle may be had. The Heavy Duty Severance Chatterless Countersink has a tanged shank and may be used with a Glenzer sleeve.

• • •

Because Severance Midget Milling Cutters are hardened to 63-65 Rockwell C and then precision-ground from the solid, they take deep, sharp bites and speed up the finishing of plastic, wood, metal and alloy castings and patterns of any kind.

• • •

Severance 72-hour regrinding service and "Severite" hardening process renews your worn tools at a fraction of new tool cost.



Enlarged view of a Heavy-Duty Severance Chatterless Countersink (with tang) and a Severance Standard Chatterless Countersink.

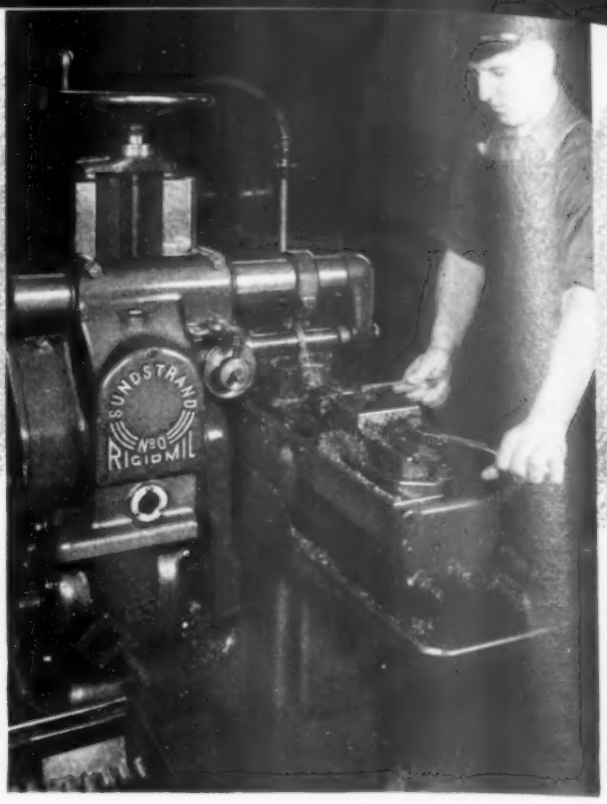
Severance

MIDGET MILLING CUTTERS • PRECISION REGRINDING • SEVERANCE TOOL INDUSTRIES, INC., SAGINAW, MICH. •
PLANTS IN LONG ISLAND CITY, N.Y.; DETROIT, MICH.; FORT WAYNE, IND.; CHICAGO; AND LOS ANGELES

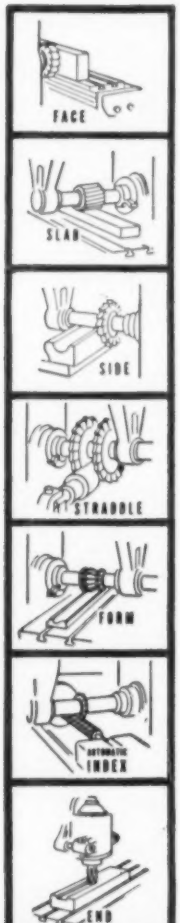
FOR PRODUCTION MILLING OF SMALL PARTS

...IN STEEL, CAST IRON AND ALUMINUM

Use any one of three Standard Rigidmils



(At Right) Illustration shows effectiveness of two-way table cycle. Operator merely changes work piece in fixture at end of table opposite from milling. Loading time is free.



AVAILABLE OPERATIONS

ALL of these milling operations can be performed on practically all metals with Sundstrand Rigidmils. Three sizes are available and whether your work consists of short run jobs in various metals or long run production you can mill either way by merely selecting the machine large enough to handle all of your parts.

High Ratio Spindle Heads For All Metals . . .

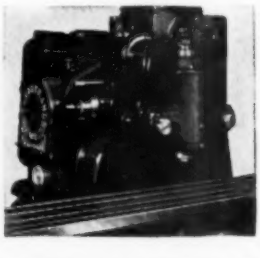
Each of the three standard Rigidmils is supplied with either one of two unusually large spindle speed ranges. Speeds for every milling job in any metal for all cutter sizes within range of the machine are easily obtained. See the specifications below for spindle speed ranges.

Wide Range of Hydraulic Feeds . . .

Infinitely adjustable hydraulic feeds together with the wide spindle speed range permit adjustment of both to obtain the best possible cutting condition and maximum production regardless of the metal being machined.

Vertical Spindle Heads

are available as extra equipment. These add further to the versatility of Sundstrand Rigidmils in handling a large range of set-ups.



(At Right) Vertical spindle-head available as extra equipment on No. 0 Rigidmils. Similar spindle-heads available for each of the three standard Rigidmils.

For Long or Short Run Milling Jobs . . .

High rapid traverse and quick acting controls reduce non-productive time on long run jobs. Simplicity of feed and speed adjustments together with ease of set-up and change-over enables Sundstrand Rigidmils to offer similar production advantage over general purpose equipment on short run work.

SUNDSTRAND ENGINEERS CAN HELP IN SELECTING MILLING EQUIPMENT

Let our engineers assist you in selecting the proper Rigidmil for your work. They will be glad to study and make recommendations on more productive methods or suggest changes which may increase production or lower cost. They are at your service without obligation. Use this service freely. Send complete accurate information with each inquiry.

FREE DATA

These interesting bulletins cover the Sundstrand No. 00, No. 0 and the No. 1 Rigidmils. Get the complete information on this versatile line of milling machines. Write for Bulletin No. 812.

MAKE A PRELIMINARY SELECTION FROM THESE BASIC SPECIFICATIONS →

These specifications cover the basic dimensions of the three smallest* Sundstrand Rigidmils. If your job requires a machine of different capacity or model send prints and production requirements for preliminary recommendations—no obligation.

** Larger sizes also available.*

SPECIFICATIONS	NUMBER 00	NUMBER 0	NUMBER 1
TABLE—Max. travel	8" Std.	18"	18"
Working surface of table	7½" x 25"	8" x 46"	10⅜" x 46"
Top of table to spindle	9⅞" max., 1½" min.	13" max., 2½" min.	14½" max., 3¼" min.
Hydraulic feed range	½" to 37" per min.*	½" to 38" per min.*	½" to 31" per min.*
Hydraulic rapid traverse	400" per min.	325" per min.	345" per min.
SPINDLE—Nose	No. 40 N.M.T.B.A. Std.	No. 40 N.M.T.B.A. Std.	No. 40 N.M.T.B.A. Std.
Cross adj. of quill	1¾"	1¾"	1¾"
Vertical adj. of spindle	8⅜"	10½"	11¼"
SPINDLE SPEEDS (by pick-off gears)			
Type A	57 to 2416 r.p.m.	25 to 1200 r.p.m.	20 to 1200 r.p.m.
Type B	85 to 3600 r.p.m.	50 to 2400 r.p.m.	40 to 2400 r.p.m.
SPINDLE MOTOR—Foot Mtd.	¾ h.p., 3600 r.p.m.	1 h.p., 3600 r.p.m.	3 h.p., 1800 r.p.m.

* No. 00: Optional feed range—1¼" to 66" per minute. *No. 0: Optional feed range—1½" to 67" per minute. *No. 1: Optional feed range—1¼" to 55" per minute.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS U.S.A.

SUNDSTRAND MACHINE TOOL CO.

2532 ELEVENTH ST., ROCKFORD, ILLINOIS, U. S. A.

Fighting Companions—

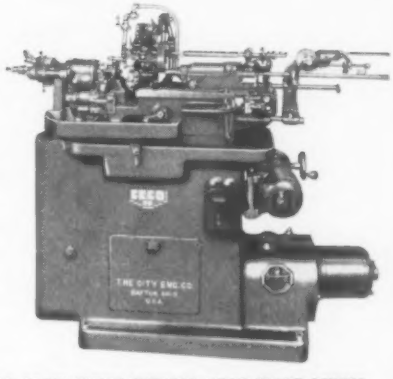
Every gun crew has a number of fighting companions whom you never see. They are the incredibly accurate precision controls which give mechanical eyes, ears and brains to our land, sea and sky defenders. Today Ceco Automatic Screw Machines are helping to turn out faster, and more economically, hundreds of extremely accurate small parts used in the manufacture of these vital military instruments, controls and accessories. And until Victory, we can think of no better way for Cecos to serve America at war.

CECO PRODUCES THIS COMPLETE PIECE IN *ONE* OPERATION INSTEAD OF *THREE*

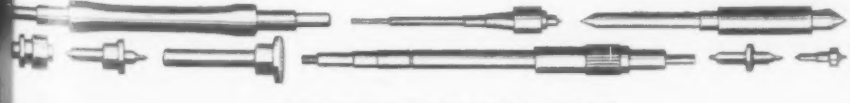
An example of Ceco's ability to speed production is this burr. Formerly its production required three operations. Ceco turns the piece, forms the ball and mills the flat *all in one operation* — and does it faster than a single operation was handled previously.

CECO IS AVAILABLE IN 3/8" AND 1/2" BAR CAPACITY WITH 4 OR 5 RADIAL TOOL SLIDES

The CECO 3-8 illustrated has four Radial Tool Slides with bar capacity of 3/8" diameter and a turning length of 1 1/2" with flat cam and 2 3/4" with bell cam. Master Speed Ranger varies Spindle speed from 675 to 6100 r.p.m. at the turn of a handwheel. And for simplicity, CECO's Precision Roller Bearing Spindle is always in adjustment and its Constant Rise Feeding Mechanism gives more accurate feeding.



FROM BAR STOCK TO FINISHED PIECE IN ONE OPERATION CAME THESE TYPICAL CECO-MADE PIECES



WRITE FOR COMPLETE ILLUSTRATED DATA

CECO

SWISS TYPE *Automatic*

UNIVERSAL PRECISION SCREW MACHINES

★

Engineered and Manufactured by
THE CITY ENGINEERING COMPANY
Dayton, Ohio

★

Since 1909, Designers and Builders of Tools, Dies, Fixtures and Special Purpose Machinery.

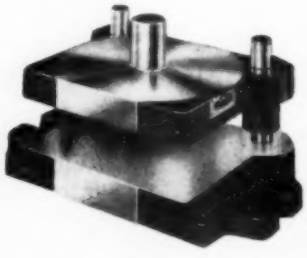
Here's to You, HIROHITO

Danly Machine Specialties, Inc. do not make hara-kari swords. We are, however, in the production line for a myriad of war materials.

We went to 3-shift operation in June of 1940. We did it for defense. We saw you coming, Hirohito, before Pearl Harbor. Danly Die Sets today are holding the dies that pound out plane parts, rifle parts, machine gun parts, tank parts, ship parts, submarine parts, parts for the defense of America and the defeat of the Axis.

Danly Weldments sail the sea, roll with the caissons, for your doom and defeat, Hirohito, and the doom and defeat of your partners.

You dared to challenge the American workman in his chosen field — Mass Production — and to threaten the security of his homeland.



DANLY DIE SETS

Welded Steel Fabrication

DANLY MACHINE SPECIALTIES, INC., *2100 So. 52nd Ave., Chicago, Illinois*

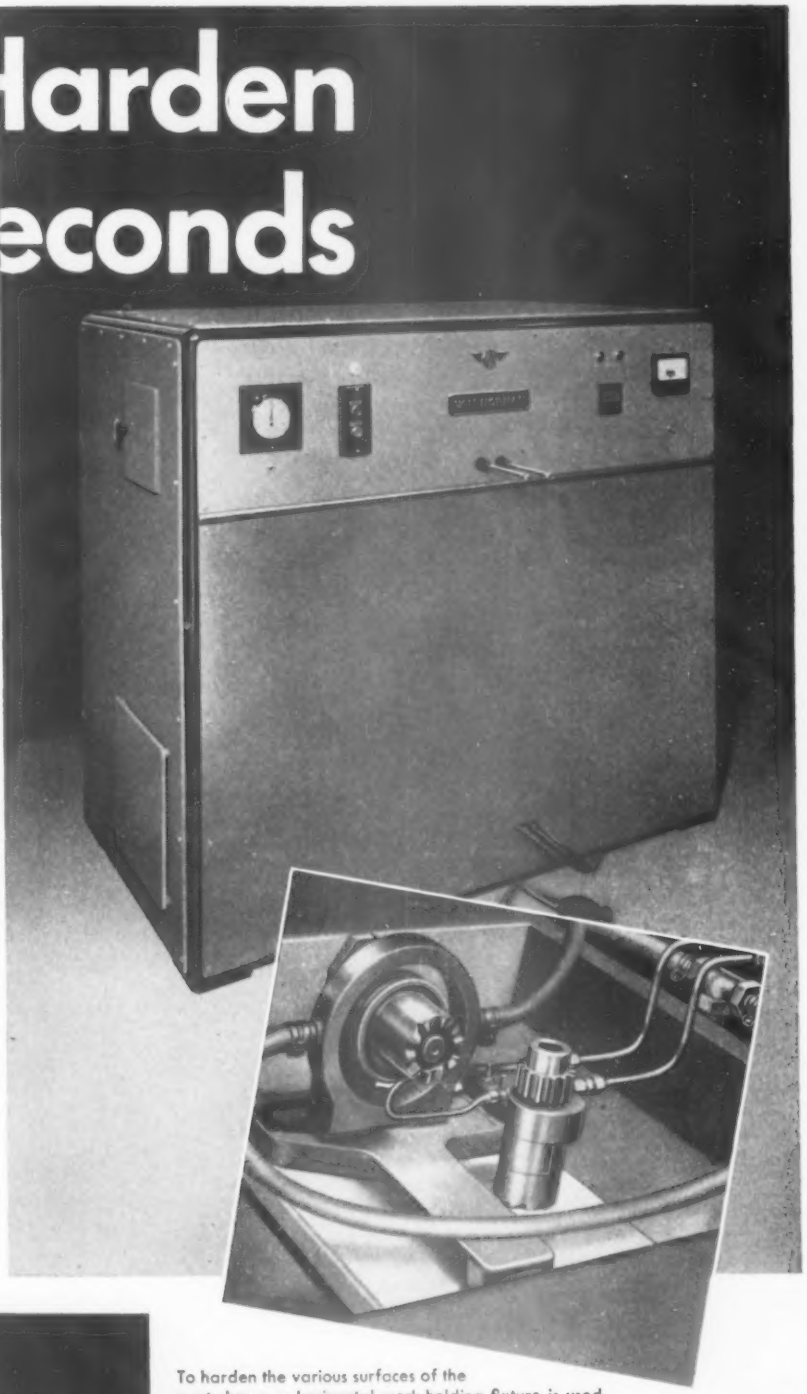
MILWAUKEE • DAYTON • ROCHESTER • LONG ISLAND CITY • DETROIT • CLEVELAND
PHILADELPHIA • • • • • • DUCOMMUN METALS & SUPPLY COMPANY, LOS ANGELES

Surface Harden Parts in Seconds

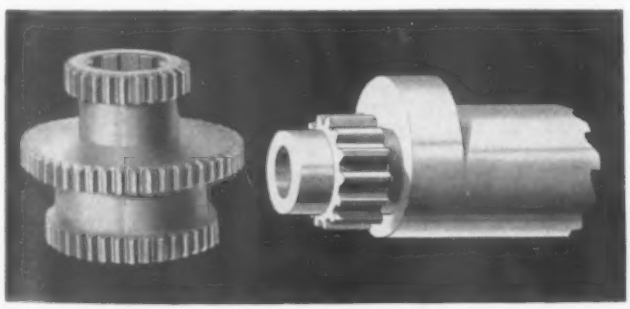
with VAN NORMAN INDUCTION HEATING UNITS

Selective Heating Saves Time, Provides Uniform Hardening, Increases Output

Van Norman Induction Heating Units enable manufacturers to surface harden parts in seconds as compared to hours when other methods such as carburizing are used. This important time-saving feature increases production and reduces costs. Since induction heating localizes heat only the section to be hardened is heated instead of the entire work piece, as when other methods are used. This feature alone reduces heating time and costs. In addition, parts, such as the teeth of a gear, are heated to provide the exact hardness wanted and to a predesired depth with practically no change in the structure of the untreated portion of the part. Induction heating eliminates possible warping and distortion and leaves the work free from undesirable scale. And because the heating and quenching time is automatic, chance of human error is eliminated and part after part is turned out with *identical* characteristics. Illustrated at right are a few typical hardening applications. Write, on company letterhead, for the new descriptive bulletin.



To harden the various surfaces of the part shown, a horizontal work-holding fixture is used. The part has three separate hardening operations. The holding fixtures and heating coils for the other two hardening operations are quite similar in design.



The teeth of each gear section of a duster of gears can be surface hardened, in a few secoads, to the desired Rockwell hardness for greater wear resistance. In the illustration, each gear section is hardened separately.

The part illustrated has three separate localized hardening operations. Gear teeth are hardened to 52-55 Rockwell C, the eccentric surface to 60-62 Rockwell C, and the clutch teeth to 56-58 Rockwell C.

Two surfaces for needle bearings are surface hardened to 62 Rockwell C on the shaft. Because heat is localized, the rest of the shaft is unaffected by the heating operation, and a straightening operation is eliminated.

Surface hardening rack teeth is a matter of seconds with induction heating. Teeth are simply held over a flat or "pancake" type heating coil for the prescribed number of seconds, followed by a cold water quench.

Van Norman Machine Tool Company
SPRINGFIELD, MASSACHUSETTS

Use Standard Jig and Fixture Parts

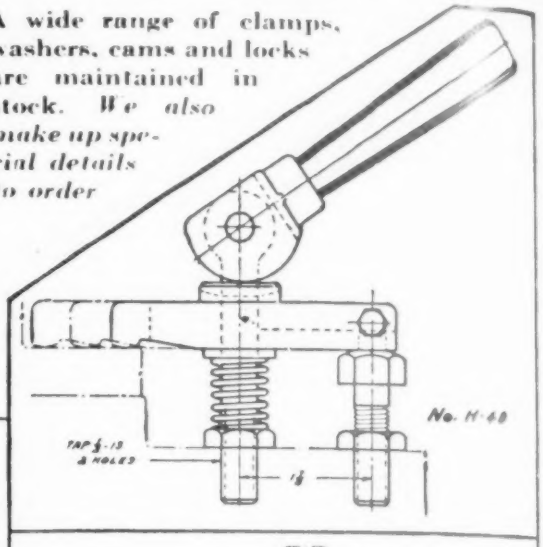
Save 50% Designing Time and Many Man-Hours in Construction

HOW TIME IS SAVED:

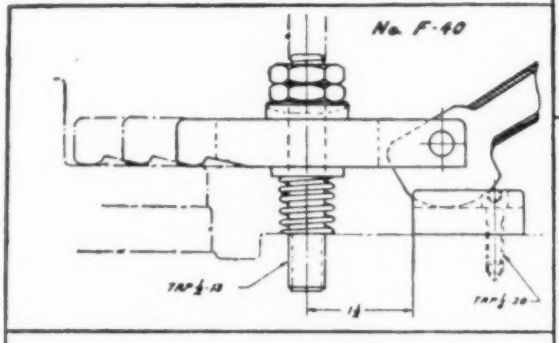
(1) Check your assembly drawings, note details
(2) Select details from Siewek Catalog (loose-leaf binder with working drawings on each page)
(3) Remove sheets with details selected, insert under layout and trace, show location and size of necessary holes
(4) Mark detail with Siewek Catalog number

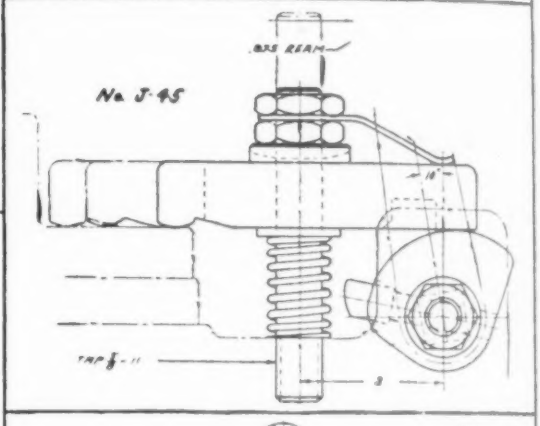
Clamps, Cams, Washers, Nuts, Clamp Rests and Hinge Pins are hardened. Studs are alloy steel heat treated.

A wide range of clamps, washers, cams and locks are maintained in stock. *We also make up special details to order*

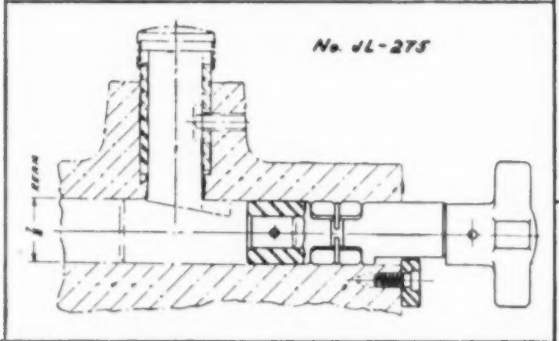


Clamp Assemblies
H-40
J-45
L-60
C-40
F-40
M-15

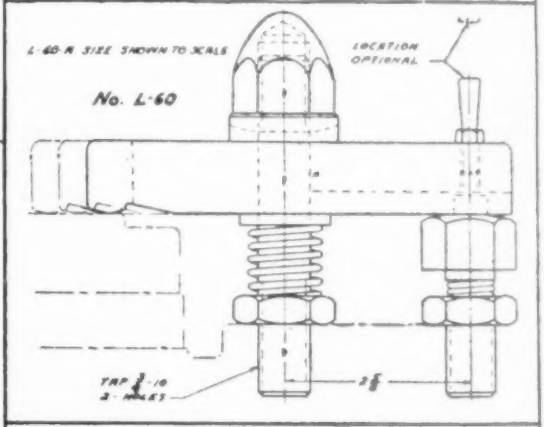


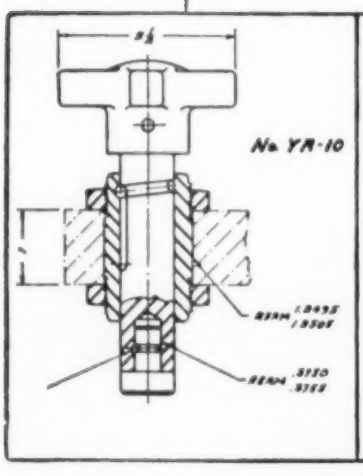


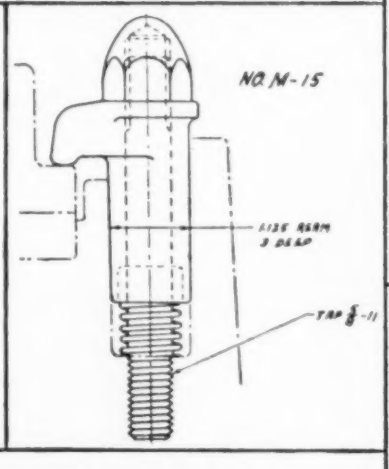
Jack Lock
JL-275

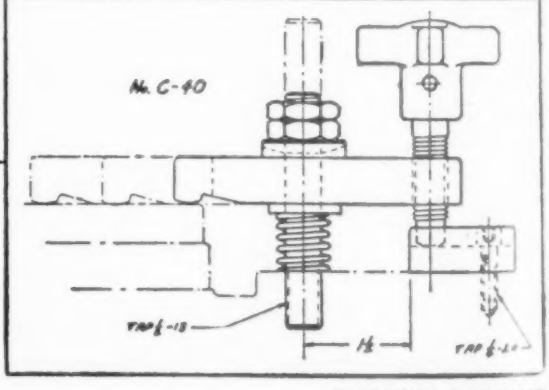


Cam Long Lock Travel Clamp
YA-10









Send TODAY for your copy of Siewek loose-leaf, template tracing catalog.

SIEWEK TOOL COMPANY

2348 Wolcott St. Ferndale, Mich.

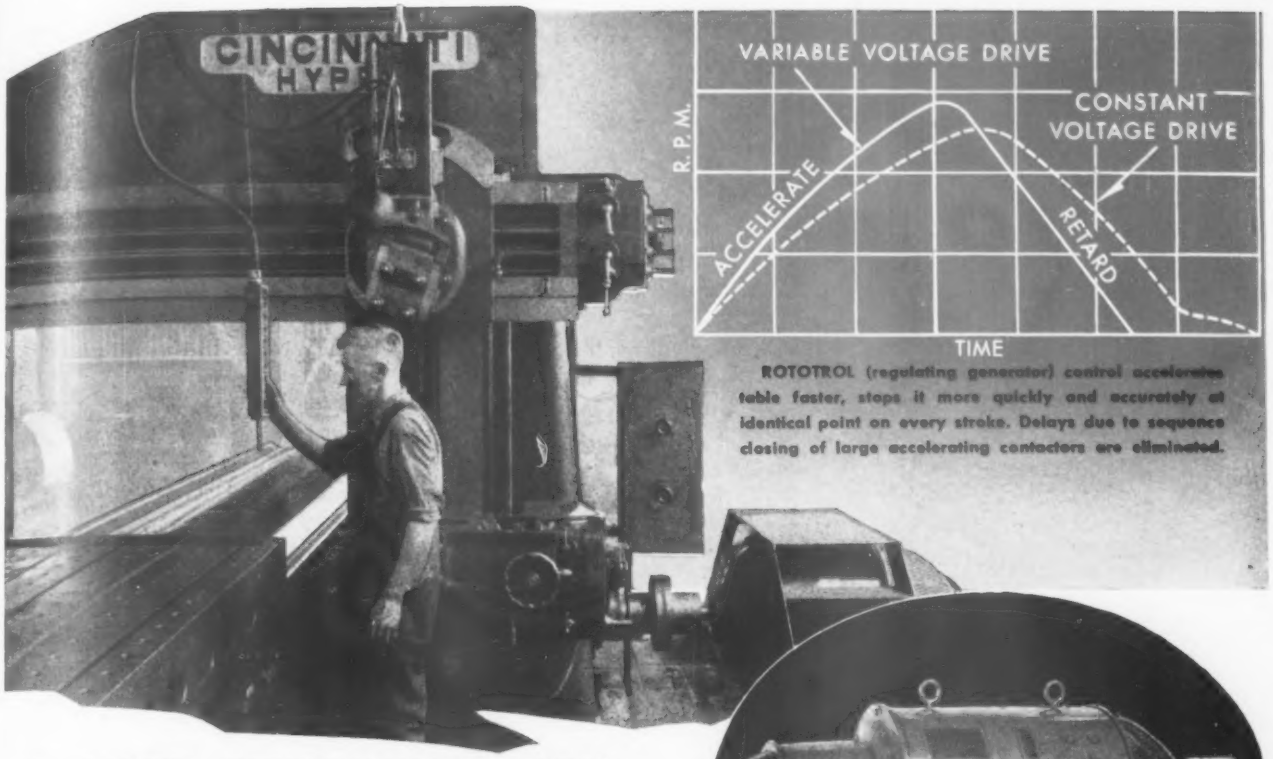
Not all masterpieces are in art galleries . . .

. . . but this is how our grinding wheels would look there! 100% in Uncle Sam's service, our custom-made wheels, *speedily* developed through our controlled trial plan, will increase efficiency in your War Production. Write for our new catalog.

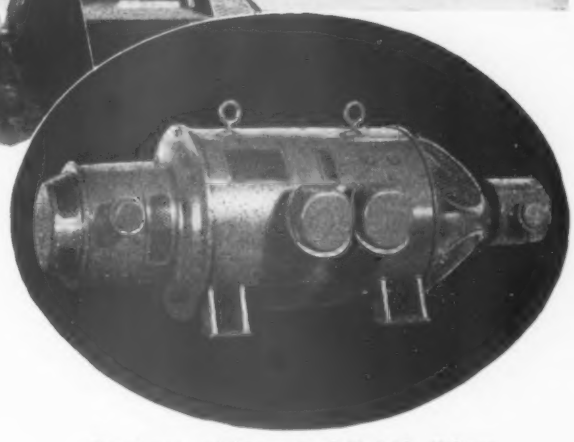
Universal Wheel & Abrasive Corp.

2626 West Van Buren Street • Chicago, Illinois

NUBON 24 HOUR PROCESS GRINDING WHEELS AND STONES



ROTOTROL (regulating generator) control accelerates table faster, stops it more quickly and accurately at identical point on every stroke. Delays due to sequence closing of large accelerating contactors are eliminated.



Four-in-one rotating unit of Variable Voltage Drive combines induction motor, variable voltage generator, exciter generator and ROTOTROL all on the same shaft. Separate cabinet houses simplified control panel.

"...NOW AVERAGING 30% (OR MORE)

HIGHER

PLANER PRODUCTION"

...thanks to ROTOTROL...new Westinghouse control

Cuts faster—returns faster! ROTOTROL—the heart of the Westinghouse Variable Voltage Planer Drive—speeds up return strokes, gives more cutting strokes per minute—with accuracy and flexibility not obtainable by any conventional control!

ROTOTROL—the Westinghouse patented control scheme—is responsible for the high rate of acceleration and retardation of the planer drive and the correspondingly greater output. The Rototrol circuit responds instantly to any change in load. As a result, planer motor speed is held constant over the entire speed range. Regenerative braking permits the table to be stopped and reversed at the precise same point every time—permitting planing up to shoulders or in blind pockets.

At the same time, a *wider* speed range (40 to 1200 rpm planer motor speed) permits cutting and return speeds to be adjusted more flexibly to the needs of the job—whether high precision die work or rough bedplate machining.

Ask your Westinghouse representative or write today for full details on this simpler, faster planer drive! Address Westinghouse Electric & Mfg. Co.

J-21204

Westinghouse VARIABLE VOLTAGE DRIVES

Speed up Production

WITH THIS NEW Sav-way MODEL M-H-2

INTERNAL GRINDER

OFFERS both hand and hydraulic table operation . . . each independent of the other . . . a new and exclusive Sav-way feature . . . permits use of both hand and hydraulic feed in combination on the same job in the same setting . . . other special features that help speed up production . . . send for literature giving details and complete specifications.

Sav-way INDUSTRIES

★ Machine Tool Division ★

4879 EAST EIGHT MILE · DETROIT, MICHIGAN

and I learned to run his Oster in a jiffy!"

Men leaving machines for military service. Experienced operators frozen to jobs. Only solution is rapid training of new operators. It's a serious problem with complicated machines. Not so with the Oster No. 601 "RAPIDUCTION" —the *SIMPLIFIED* Lathe now equipped with automatic indexing of its 6-station turret.

Capable of handling a wide variety of bar and chucking operations, including unusually heavy forming cuts, Oster "RAPIDUCTION" Turret Lathes have SIMPLIFIED the problem of training new operators rapidly to necessary standards of efficiency.

Does this seem to offer YOU at least ONE solution to YOUR problems of man-power shortage? If so, use the form below NOW!

No Time Out to Celebrate Our 50th ANNIVERSARY 1893-1943

OSTER

THE OSTER MFG. CO., 2063 E. 61st ST., CLEVELAND, OHIO, U. S. A.

We are seriously interested in the Oster No. 601 "RAPIDUCTION" Turret Lathe. Please send Catalog No. 601 at once.

NAME_____

ADDRESS_____

CITY_____ STATE_____

PRODUCTION PERSPECTIVES*

LAST-MINUTE NEWS REVIEW OF MASS MANUFACTURING

*T.M. REG. U.S. PAT. OFF.

oduction Outlook: The course of battle will definitely affect every industry and engineer. Cutbacks in certain production have produced talk of unemployment in specific areas. Truth is, 1943 production will be greater than ever but products will be fewer. The anything-and-everything days are over....If you're producing parts for ships or aircraft, you're going to be pushed. If you're on ordnance, it will be slower until European invasion is launched - when the need for materiel shot away will be enormous.

Ships: The Maritime program is well known. The Navy will build as many vessels this year as it had in service at the end of 1942....Planes: Output at the end of the year is expected to be double the 7,000 planes produced last month. Light planes will form a decreasing percentage of the total. Plan is for the big plants to farm out more work. Materials and fabricating facilities are now behind assembly capacity. The U. S. production goal stands at 100,000 war planes this year.

Concentration: WPB has backed down on plans for concentration of industry geographically. Discovery of the interdependence of industry and the inability of concentrated industry to readily change its type of production were the reasons given by Chairman Nelson....Plant Expansion: Decline of facilities expansion predicted here has been confirmed. New construction in the first 3 months of 1943 dropped 32 per cent below the previous quarter. Shift from preparation to full scale armament output is now in full swing....Small plants: Greater small plant participation in war production finally looks probable. Reason: Dynamic, two-fisted Col. Robert W. Johnson, chairman of the Smaller War Plants Corp. After explaining to prime contractors that they must keep the little shop alive to guarantee their own post-war security, he has warned them to subcontract or look for trouble. A distressed small plant, he says, is "one that is operating at less than 66.66 per cent of its normal production"....If yours is a small shop, you may get some Navy work soon. That service, having already placed a large percentage of its contracts, is pushing prime contractors to speed their output by subcontracting - to small concerns.

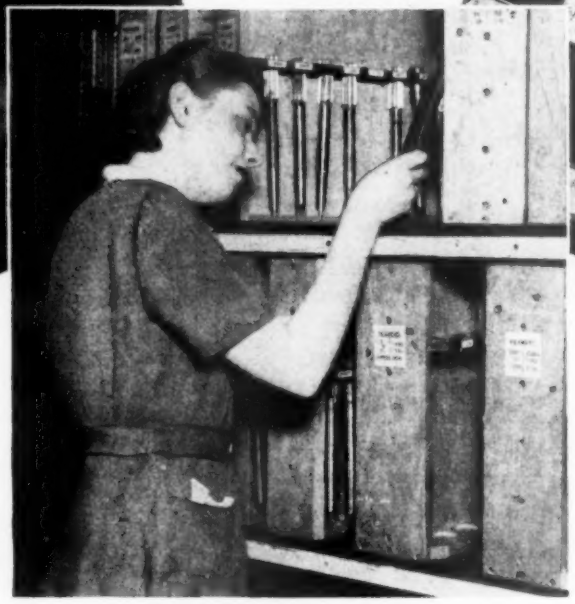
Materials: Alloy steel output in March amounted to 16 per cent of the total steel production, compared with peace time percentages of between 5 and 6 per cent....Raw materials, rather than labor, still are the most important limiting factors in war production....Civilian Supplies: With essential consumer goods shrinking dangerously, plans are afoot to create a new agency to wrestle with civilian manufacture....Segments of the trade press have given a "reconvert before war ends program" encouragement by playing big the news of a possible surplus in steel this year. Overlooked are these vital factors: (1) Manpower and machinery shortages; (2) Iron ore shipments necessary to meet war production steel demands alone are more than 6,000,000 tons behind schedule because of ice-locked upper Great Lakes; (3) Cutbacks in certain war jobs are temporary - once Europe is invaded ordnance demands will skyrocket.

Absenteeism: A survey in nation-wide General Motors plants reveals that absenteeism is concentrated in a chronic fringe of 10 to 20 per cent of the total working force. GM explains that each per cent of lost time actually reduces production 2.5 per cent in highly tooled metal cutting industry. Based on an average of 6 per cent absenteeism, this means a total loss of 15 per cent in production.

IF THESE WORKERS "Fumble" YOUR MACHINES STAND IDLE

Prominent numbering of the receptacles for small taps and plug and ring gages makes for speedy handling, minimum delay at the tool crib window in this efficient crib arrangement. *Photo courtesy General Electric Co.*

These swinging racks give ready access to reamers, maximum protection to each tool. Quick identification even for inexperienced help is assured by prominent labels in front. *Photo courtesy General Electric Co.*



Installed for temporary storage of small items, these oblong cans have given very satisfactory service. Composition containers might well be substituted if metal ones are not available. *Photo courtesy Brewster Aeronautical Corp.*

EVERY needless minute your costly machines stand idle between jobs means less production for you — and a longer war for all of us.

The photographs here may show you the way to an important saving. For each shows an arrangement that gets tools on the job with no waste of those precious minutes.

No one of these arrangements may fit *your* shop . . . but that's not the point. They may suggest a method adaptable to your requirements.

In checking your tool storage methods, keep these three fundamentals in mind:

1. A place for every tool, with a record to show its disposition when it's out.
2. An easily read and systematic means of identification.
3. Ample protection for keen cutting edges.

There are few places in your plant where careful planning will pay you more than your tool crib.

GTD GREENFIELD

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Tool Conservation Begins in the Tool Crib

Chevrolet engineers at plant layout boards studying conversion problems in transition from automobiles to aircraft engines.

Chevrolet Builds Radial Engines

A complete consideration of problems faced by automotive production engineers in meeting closer tolerances, cutting unfamiliar metals, and converting plants and personnel for the successful operation of a broad range of machine tools.

IN three huge plants in the Buffalo, New York, area, (two of them converted from automobile assembly and parts manufacture) the Chevrolet Motor Division is today mass producing 14-cylinder Pratt & Whitney radial engines.

In a specially conducted tour of these plants, the first to be made by a trade press or newspaper writer since auto production ceased little more than a year ago, executives of this General Motors division recently revealed to a TOOL ENGINEER representative the history of their huge conversion project and every step in the manufacture of hundreds of machined parts produced for this engine.

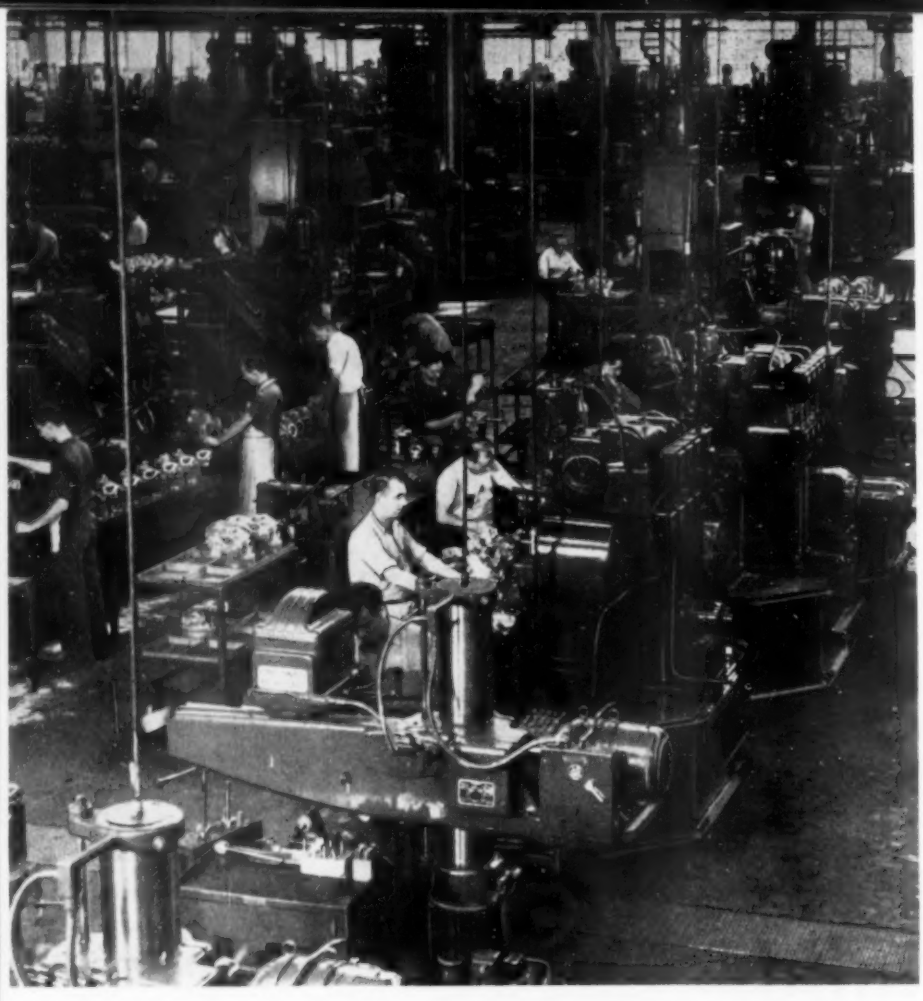
Impressive for the size of its production schedule, the project is still more impressive from the standpoint of complete conversion of manufacturing facilities, training of personnel inexperienced with machine tools, and fabrication of parts to precision tolerances from materials which automobile engineers had never seen before.

WALLACE A. SCOTTEN
ASSOCIATE EDITOR

FOR the sake of brevity, certain salient facts may be cited regarding Chevrolet's production of radial aircraft engines. First, each cylinder in the aircraft engine has a greater horsepower output than the entire automobile engine previously manufactured in this plant. Second, the majority of the manufacturing operations on radial engines require finish machining of the total area of the part; relatively few in auto building fall into this category. Third, production engineers in the auto industry have worked almost exclusively with cast iron and steel; many radial engine parts are magnesium and aluminum. Fourth, this auto manufacturer was called upon to build this complicated unit long after other large manufacturers had become licensees of Pratt & Whitney and had absorbed the productive capacity of the most likely vendors of fabricated metal parts.

Consequently, Chevrolet engineers were faced with the task of manufacturing in their own plants the vast majority of some 900 parts which go into each of these 1,200-horsepower engines.

Production is centered in three large plants in the Buffalo area. One of these was a combined Chevrolet car and truck assembly plant, Fisher Body plant and General Motors parts storage warehouse. These contiguous buildings have been converted into a vast machine shop known as Aviation Plant Number 2, which is cur-



Machining cylinder heads for Pratt & Whitney aircraft engines in the converted motor and axle plant. Overall view well illustrates the concentration of machine tools this former auto builder achieved in this undertaking.

rently turning out about 100 important machined parts for the engine. These parts include the master connecting rod, the articulated connecting rod, pistons, gears and valve rockers. Most of the machining here is done on steel.

The Motor and Axle plant, was turning out motors and axles little more than a year ago. One of the best and most modernly tooled plants in the country for this phase of auto manufacture, it was divested of acres of costly machinery and refilled with thousands of new machines for turning magnesium, aluminum and steel. Today, it is producing such parts as the power section comprised of the 3-section aluminum crankcase, cylinder barrels and cylinder heads; the blower section or supercharger housing; and the intermediate rear and flat rear sections, besides crankshafts and propeller shafts.

In a third Government-owned structure, known as Aviation Plant Number 1, built and operated by the auto manufacturer, parts are assembled into completed units ready for installation in bombers and heavy fighting ships.

Conversion of the Motor and Axle plant to aircraft engine parts manufacture was a Herculean task. The plant, which embodied complete facilities for building motors and axles from castings and forgings, spread over 700,000 square feet under one roof.

Under the conversion program, fully 75 per cent of the original machinery was replaced. The only large shop department maintained was the tool room. Several miles of conveyors specially designed for engine and axle handling were torn out, and hundreds of pits in the floors were filled for the installation of a new type of machinery. A constant temperature gage room was added and several thousand machine tools were installed for cutting aluminum and magnesium castings and steel forgings.

On December 24, 1941, this plant was producing axles. On March 1, 1942, it was completing aircraft engine parts.

But Chevrolet engineers admit that the biggest job was not actual conversion, but acquiring a knowledge of techniques necessary for handling new types of material. Passing through a department in which hundreds of machines were cutting magnesium, one of the top production executives remarked, "Hell, none of us here had ever seen a piece of magnesium before they told us we were going to build these engines." Standing rules for cutting this new light metal at Chevrolet today are sharp cutters and light cuts. Both prevent burning or fire.

Though they had been building one of the finest mass-produced automobile engines, the tolerances, finish and blended surfaces demanded in aircraft engine manufacture presented new experiences for Chevrolet production men.

Finish boring articulated rod pin holes on master rod for Pratt & Whitney engines.

Gleason grinders working on master and articulated rods, rocker arms, oil pump gears and pistons in converted assembly plant. Floor was occupied by auto assembly lines, little more than a year ago.

This converted shop turns out the majority of the heavy parts which go into the Pratt & Whitney engine. In machining, 30 pounds of magnesium, 141 pounds of aluminum and 800 pounds of steel are removed to finish parts for each engine.

One of the largest departments handles the three-piece crankcase power section. Rough aluminum forgings for the front, center and rear sections are brought to one end of three rows of Bullard vertical turret lathes, where the initial cut is made. The machines are run at top speed. A special Sunstrand profile mill, which has a capacity equal to three radial drills formerly used on the job and costs less than one drill, is used for the finish cuts. All sections are inspected in one department before assembly for additional machining.

After the three sections have been assembled into one unit, the crankcase section presents fourteen flat surfaces equally spaced around its periphery. The angle on these surfaces must be accurate within 0.0002. These front faces are milled on a Sunstrand Rigidmil.

The rough bore, finish face and chamfer is done on a special Sundstrand machine that automatically indexes and performs all cutting operations from one head.

Bronze liners for the main bearings are inserted in the assembled unit before it cools after emerging from a conveyorized heat treat oven affording benefits of shrink fit, without necessitating special heating. The front and rear surfaces of the section are ground to finish on one specially tooled Bryant grinder. After burring, the rough surfaces are painted and bushings are installed. A matching of the three sections is made before shipment to the final assembly plant.

For cylinder barrel manufacture, the rough steel forging weighs 52.5 pounds. After rough machining and heat treating, the weight has been reduced to 24.5 pounds. The finished barrel weighs a scant 8 pounds.

The I. D. is rough machined and the ends of the barrel are turned on Bullard Mult-Au-Matics, while the fins on the barrel are cut on Fay automatics. Heald and Bryant grinders are used to finish the I. D. and the O. D. is finish-ground on Norton machines.

Another steel part finished in this plant is the crankshaft. The rough forging weighs 181 pounds, the finished crank 72 pounds. In removing 110 pounds of stock and finishing, about 150 operations are performed. The majority of these operations are performed on Monarch automatics, Wickes lathes, Cincinnati vertical millers, Gisholt turret lathes, P. & W. vertical shapers and Landis grinders.

From the standpoint of conversion and plant layout, the Fisher Body and Chevrolet assembly plant unit (Aviation Plant Number 2) in this aircraft engine manufacturing project may have presented more interesting problems.

Profiling and rough cutting articulated rods for Pratt & Whitney engines. This operation is now performed by women exclusively.

Each worker controls two Milwaukee machines. Note positioning of machines to facilitate this control.

"Green" assembly line in new defense plant. On this moving conveyor line, engines are built up in tilting cradles attached to drag chain on the floor. Sub-assemblies are made in departments at right angles to this line, and are moved directly onto the line for attachment to the engine. After testing, the engine is completely torn down on another line, washed, inspected and reassembled on a final line. The cylinder assembly, built in another Buffalo area plant is being installed in the engine.

Battery of Jones & Lamson turret lathes producing small parts. Note the large cement pillars placed on 25-foot centers throughout the plant. These pillars vastly complicated the machine tool layout problem in this factory and the adjacent Fisher Body assembly plant which was converted.

Because of its type of construction and general layout, the assembly body plant was probably much the harder of the two Chevrolet plants to convert. The Motor and Axle plant, less than five years old, was designed for mass production of heavy parts. It is ideal for the installation of machine tools, with wide areas of uninterrupted floor space on one level.

The auto assembly plant, body plant and adjacent automobile parts warehouse provide a total floor space available for manufacturing operations of 450,000 square feet.

The body plant is two stories high with a bridge across to the second floor of the adjacent assembly plant. Automobile bodies were moved across the bridge and lowered through the floor onto chassis lines on the first floor of the assembly division.

Built in 1923, both structures are of excellent construction but were designed exclusively for such operations. Automobile assembly is a relatively light job. Consequently, the first floor, which was built on city fill, is not deep; and the second floors of both buildings were designed to support a weight of only 125 pounds per square foot.

Layout for production was further complicated by the fact that the second floor concrete support pillars are spaced on 25 foot centers. With a light second floor, all heavy machines had to be installed on the ground level. Since economical production operations will not permit parts requiring both heavy and light machines to jump from floor to floor without loss of time, machine tool layout was exceedingly complicated.

The assembly plant second floor had a number of openings for conveyors, as well as hatchways for body drops to assembly lines below. These had to be closed, and frequently braced from below with I-beams. These further cut up ground level floor space and reduced head room.

SOLVING A LAYOUT PROBLEM

More than 15 I-beams were installed, some for floor support where holes had been covered, others where it was absolutely necessary to install such machines as a 25A Defiance jig bore which required a heavy floor pad, and Krueger 2-way horizontal drilling machines.

Consequently, such departments were installed on the second floor as tool sharpening with batteries of light cutter grinders. Heavy production grinders, with large wheels that vibrate when slightly out of true, were kept on the ground level. The maintenance department was placed on the second floor. In this department, the only machine tool requiring a column for support was a Cincinnati shear. Spare machine parts and stores also are on the upper level.

The gage repair and tool design, along with the tool room, is maintained on the upper floor. Almost without exception, production work performed on the second floor is done on small screw machines and turret lathes.

Peculiarly enough, this light second floor construction resulted in greater density of machines. When the first few machine tools were installed on this floor it was found that the vibration was severe. This problem was solved by packing in more machines.

If these buildings had been designed for machine tool installation, the second floors would have been built to support a load of 450 pounds or more per square foot.

Two other structures on this property were converted for parts manufacture and these presented unusual problems for plant layout men. One was formerly a new car conditioning building. Of shed construction, it stretches along one side of the body plant. An eight foot ceiling sheltered rows of pits over which new cars were driven for final inspection. To prepare this space for the installation of machinery, it was necessary to fill in the pits and lay cement mats.

In order to make the fullest possible use of the floor space in this building, a job was selected that required low machines which could be repaired under the eight foot ceilings

Such a job was machining the valve rocker arm. Tools required included special Kingsbury multiple spindle drill presses, Foote-Burt five-ton broaches, Bryant internal grinders, polishing lathes, and Kent-Owens horizontal milling machines. Later it was discovered that production could be increased and quality improved by using a Snyder Special 10-V vertical drill. Because a ceiling at least 12 feet high was necessary to remove the head for repairs, the machine could not be installed. Expanded production required more space for rocker arms and this job was moved out of the shed, and machine tools were installed for handling the thrust bearing nut. Ex-Cell-O machines are used on thread grinding.

In the adjacent General Motors parts warehouse, completely renovated for the installation of machine tools, the ceilings are amply high for the operation and repair of units 15 feet high. The building provides 38,000 square feet of working space.

Today, this single-floor warehouse is one big machine shop and turns out such precision parts as rocker arms and pistons. Rocker arms are steel and pistons are aluminum. Fifty per cent of the machine tool operators here are women, turning out 14 of each unit for the Chevrolet radial engine production schedule in addition to 100 per cent spares.

ALL GRINDING IN ONE AREA

In the main building, layout was complicated by varying ceiling heights as well as the spacing of second-floor supports. Ceiling height in the side bays is 14 feet; in the center bay, 24 feet. Consequently the tall Foote-Burt broaches used on the master rod and articulated rod and the Bullards on the cam rims are installed in the center bay.

All grinding and polishing is performed in one area, confining grinding dust and reducing vibration from other heavy machines. Heald Sizematic internal grinders are used to finish grind the main crankshaft bearing hole. This department is 250 feet from the heavy Foote-Burt broaches used on the joint face of the master rod and cup.

The gear grinding department now fills the area occupied by the old Fisher Body spray booths and ovens. The gear grinding battery is composed of Pratt & Whitney single and two wheel machines. Stop off lacquer

OPERATIONS SHEET

for Chevrolet-built Pratt & Whitney Articulated Connecting Rod

- Broach top and bottom of "H" section and both bosses.
  Foote-Burt 25-ton Duplex Broach.
- Spot drill, drill and rough ream (2) holes.
  Natco No. 4 AL Holesteel Drill.
  Station No. 1: Load and unload;
  Station No. 2: Spotdrill;
  Station No. 3: Drill (1) 1-3/16" and (1) 1-11/64" hole half through;
  Station No. 4: Drill both holes through;
  Station No. 5: Rough ream (2) holes.
- Grind top and bottom of "H" section and wash.
  Thompson 12x12x24 Surface Grinder.
  Kerosene Table.
- Finish ream holes. Wash in kerosene.
  Defiance No. 112—21" Drill.
  Kerosene Container.
- Broach plain sides and (4) radii between bosses and plain side.
  Foote-Burt 15-ton Duplex Broach.
  American 15-ton Duplex Broach.
- Rough and finish shape large end.
  Fellows No. 61 Special Gear Shaper.
  (1 man operates 2 machines).
- Rough and finish shape small end.
  Fellows No. 61 Special Gear Shaper.
  (1 man operates 2 machines).
- Circular mill large end flush with top of "H" section (both sides).
  Milwaukee No. 2 H Vertical Mill.
  (1 man operates 2 machines).
- Circular mill small end flush with top of "H" section (both sides).
  Milwaukee No. 2 H Vertical Mill.
  (1 man operates 2 machines).
- Spot drill, spot face both sides.
  Foote-Burt 1-Way Vertical Drill (8849-C used until new machine arrives).
  Station No. 1: Load and unload;
  Station No. 2: Spot drill 1-3/16" hole;
  Station No. 3: Flat bottom drill 1-3/16" hole.
- Stamp lot number on top of "H" section.
  Rubber stamp and bench.
- Rough and finish mill channel in 1 cut (2 sides).
  Cincinnati No. 28—60 Vertical Hydrotel Mill.
  Cincinnati No. 28—96 Vertical Hydrotel Mill.
- Degrease.
  Detroit Detrex Degreaser.
- Magnaflux and demagnetize.
  Magnaflux Model Anq. 484.5 unit.
  Demagnetizer.
- Heat treat—bake at 550° for 1½ hours.
  Gehnrich Draw Furnace.
- Grind top and bottom of "H" section, and top and bottom of both bosses (12 rods per set-up).
  Thompson 12x12x24 Surface Grinder.
- Drill (2) holes and (1) No. 20 hole.
  Snyder Special Drilling Machine.
- Burr drilled holes.
  Keller Air Grinder.
- Grind large hole; check hole for squareness in (2) directions and for center distance.
  Bryant No. 16—28 Hydraulic Hole Grinder.
- Grind small hole; check hole for squareness in (2) directions and for center distance.
  Bryant No. 16—28 Hydraulic Hole Grinder.
- Grind O.D. of large hub and grind necks (16 rods per set-up).
  Mattison 14x16x60 Surface Grinder.
- Grind OD. of small hub and grind necks (16 rods per set-up).
  Mattison 14x16x60 Surface Grinder.
- Stamp lot number on O.D. of large hub.
  Rubber stamp.
- Grind sides of "H" section (8 rods per set-up).
  Thompson 12x12x24" Surface Grinder.
- Cut radius on large and small end (both sides).
  Sundstrand 2-Way Centering Machine.
- Remove sharp edges from both bosses.
  Hammond No. 2 R Polishing Lathe.
  (Also used on 20506 Operation 12).
- Degrease.
  Detroit Detrex Degreaser.
- Magnaflux and demagnetize.
  Magnaflux Model Anq. 485.5 unit.
  Demagnetizer.
- Hone knuckle pin hole.
  Barnes No. 172 Single Spindle Honing Machine.
- Hone piston pin hole.
  Barnes No. 172 Single Spindle Honing Machine.
- Degrease.
  Detroit Detrex Degreaser.
- Inspect.
- Oil, wrap and pack.

is used to keep the teeth soft in carburizing. The heat treat department, with Lindberg gas-fired draw furnaces and Gleason roller die quenching, is exceptionally clean. The 6,000 gallon enamel tanks used in enamel finishing before the plant was converted are now used for quenching oil storage.

Magnesium parts are machined on the second floor. Chips and scrap are stored in a small fireproof building outside the plant. The old body trim shop has been filled with light lathes and drill presses for handling this new metal. Duval is the cutting fluid.

All rejected small magnesium and aluminum parts, such as the pump body, are sent to a salvage room for further inspection. This has resulted in a reduction of rejections as a second inspection sometimes proves that the part actually meets requirements.

Outstanding among steel machining operations are those performed in turning out the master connecting rod and articulated rod. Among the interesting operations on these parts is the use of broaching on both rods, as well as the use of a Fellows gear shaper instead of a mill on the end of the articulated rod.

Ten rods are gang ground on Thompson surface grinders, removing .010 to .030. The ends of articulated rods are gang ground 16 at a time on a Mattison surface grinder. Operations on the master rod number 189. (See accompanying table).

MANY TESTING OPERATIONS

Chevrolet's final assembly of the 14-cylinder radial engines is carried on in a Defense Plant (Aviation Plant No. 1) specially designed for this work. It embodies every known facility to expedite "green assembly", testing, final assembly and shipping. Most of the machined parts for engine assembly come from the two large plants the company converted in this area. Eight other Chevrolet plants outside this area and a large number of sub-contractors also supply miscellaneous secondary parts.

Radial engine manufacture differs greatly from automobile engine manufacture in the muliplicity of assembly and testing operations. Whereas auto engine building requires only one assembly, followed by a run-in test, radial engine building requires a first assembly, test, tear-down and inspection, complete assembly a second time and final test.

Checking an inspecting articulated rods for accuracy, weight, taper, after machining in converted Chevrolet plant.

THE extent of manufacture actually performed by Chevrolet in its Buffalo area plants is tied in with the history of this war contract. The company became a licensee of Pratt & Whitney and commenced operations some time after other automobile concerns had gotten under way on this type of work.

The last car rolled from the final assembly line in Buffalo on July 30, 1941. Twenty days before, the work of tearing out automobile assembly tools had commenced in the plant, and shortly after the last car was finished, this work was in full swing. Since the experience of these two shops had not been metal cutting, the plants were not designed for the installation of machine tools. Most of the equipment, cleaned out by November 15, was jigs for body welding, finishing and painting. The assembly lines and conveyor systems were designed to handle the assembly from already finished parts of cars and trucks. The electrical system had to be changed from 25 cycle to 60 cycle. The lighting was fluorescent, but was centered over the long body and car assembly lines. Much of the building heat was provided by radiation from the body drying ovens.

Supervisory personnel had to be transferred from other Chevrolet plants and workers, formerly engaged in auto assembly, had to be trained in the operation of machine tools.

Then, before Chevrolet had a chance to test their tooling, Pearl Harbor brought a tremendously increased order for engines. March, 1942, brought another increase, and early 1943 witnessed still another increase.

The initial production program in the converted Fisher Body plant and Chevrolet assembly plant called for the manufacture of 306 of the 900 parts in the 14-cylinder radial engine. As the total order for engines rose, manufacturing operations were transferred to Chevrolet plants in other parts of the country. The total number of parts now turned out in mass volume in these two Buffalo units stands at approximately 100.

This new plant is laid out for straight line assembly, with stock receiving at one end and final inspection and shipment of engines at the other end. All parts, whether they come from vendors, or company plants, under-go a careful inspection for quality and tolerance in a huge bond crib. Every part used in engine assembly comes from the bond crib.

The "green", or first assembly line, extends from the bond crib down the entire length of the building. Engines are built up on dollies which are attached to a continuously moving drag chain in the floor.

Parts from the bond crib are carried by conveyor to the outer end of sub-assembly departments which are at right angles to the assembly line. There parts are built up into sections and moved through the sub-assembly departments to the assembly line where they are installed in the dolly-slung engines.

The assembly dollies, which are equipped with large casters, support the assembled engines while they are moved into the test house which extends down the other side of the building. Chain falls on monorails are used to lift the engines from the dollies into special fixtures inside each test cell. These fixtures position the engine so that connections with fuel and electrical lines in the cells and instrument panels outside the cells can be made in a minimum of time.

In the cells, the engines are tested under actual weather conditions. Rain, sleet and snow, depending on weather conditions outside, are drawn into the cells. Special propellers for varying atmospheric conditions are used in testing the engines up to a peak rate of 3,700 rpm.

Disassembly is performed on a moving line in the reverse order of "green" assembly. Sub-assembly by sub-assembly, the engine is torn down in its supporting dolly. The sub-assemblies are separated, washed and distributed to a department adjacent to the line for inspection.

The final assembly line parallels the inspection department tables. There, engines are built up from sub-assemblies in the same manner as "green" assembly.

After a protracted final test in the cells, the engines are finally wired and washed at the lower end of the building, packed and hermetically sealed for shipment to airplane plants and the fighting fronts.

FINAL ASSEMBLY

Sequence of operation in final assembly is dictated by the design of the engine. Starting with the blower section, parts are mounted on this unit in a hands-down position until one side of the engine is completed. Then, the dolly, which includes a trunnion fixture, designed like a welding positioner, permits rolling the engine over and the power section is mounted on the other side of the blower section. Studs in the power section are set automatically, resulting in a drastic reduction in assembly time.

Because each sub-assembly is inspected during assembly, the only inspection necessary on the line is in the fitting and fastening of major parts.

Cylinder heads and ignition systems are mounted on the power section, having been brought to the line by platform conveyors. The fourth major assembly line operation involves the installation of the nose section and propeller mount. Near the end of the line, such small accessories are added as push rod covers and the thermo-couples for testing cylinder temperature in the test house. Sheet metal or plastic parts with loose tolerances, such as push rod covers, exhaust and intake pipes, which are installed on the "green" line are used over and over on first assemblies. Clean parts from the bond crib are used in the final assembly for shipment from the plant. THE END

Stop End Thrust

Here are practical solutions to a common machine design and maintenance problem, giving specific applications that will cure many problems, suggest answers to others.

JOHN E. HYLER

MOST TOOL ENGINEERS can think of machines which were not as competent as they might have been, had proper attention been given to controlling end thrust and end motion. Because the problems vary, requirements for meeting them differ.

Where the thrusts endwise on a machine spindle are highly variable, and no end motion is allowable, the only safe proposition is to protect against the greatest amount of end thrust that can be expected. There are many such cases. On horizontal milling machines, where a wide range of speeds, feeds and loads may be encountered, the engineer never knows when a beveled cut will cause end thrust on the spindle in one direction or the other. Absolute endwise rigidity of the spindle is demanded. The method of obtaining it, as practiced by various designers, is simple. Figure 1 shows how a thrust bearing ring A is rigidly mounted in the bearing housing, and a ball thrust bearing fits snugly against this ring from either side, preventing any motion. There is strategy in locating thrust bearings close together in this manner. In protecting a spindle against motion in either direction axially, over so short a span as that represented by the thickness of the ring A, expansion differentials caused by temperature variations will always be negligible.

When disc grinding to high accuracy is required, axial rigidity of the shaft on which the disc is mounted is imperative. To obtain such rigidity, the same sort of thrust bearing layout is often employed. In the layout shown in Figure 2, however, provision was necessary to lubricate thrust bearings directly through the thrust bearing ring at B, a fitting being provided for that purpose.

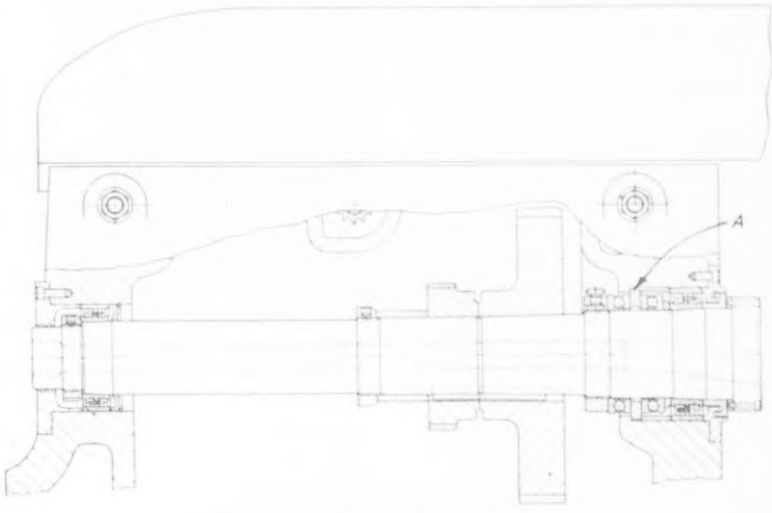


Figure 1, milling machine spindle design. Thrust bearing ring marked A.

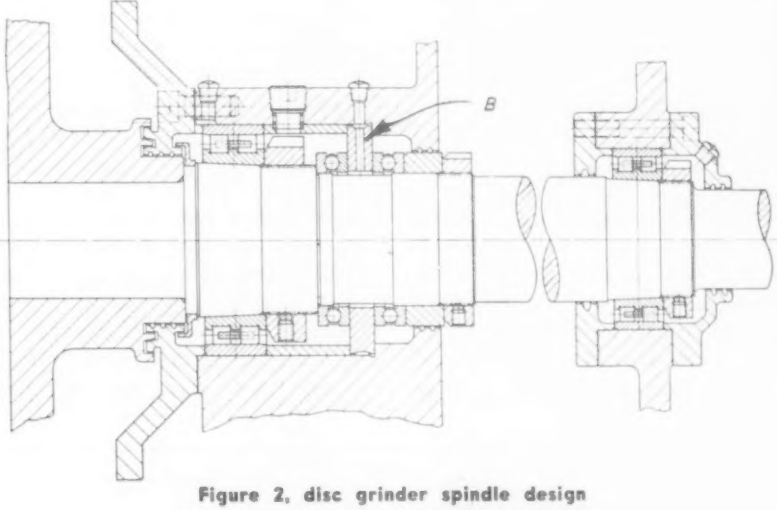
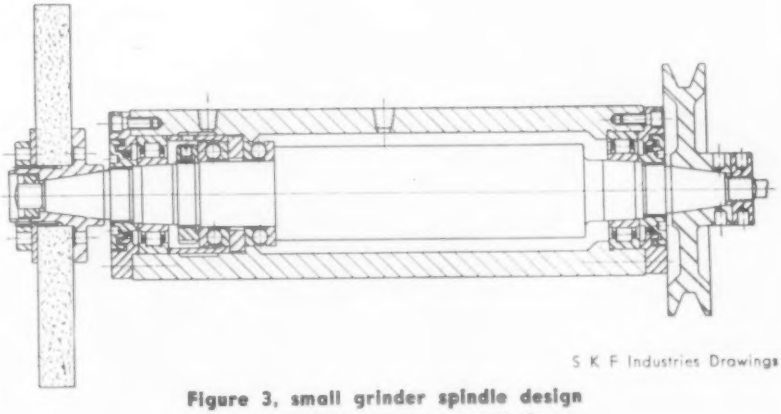


Figure 2, disc grinder spindle design with provision for lubricating bearings.



S K F Industries Drawings

Figure 3, small grinder spindle design for chatter-free work on all faces.

Even on small grinders designed to carry grinding wheels, this type of provision is well worth while, if chatter-free performance on all wheel faces is required. In some cases, this has been done as indicated in Figure 3. However, where grinding is on the periphery of the wheel only, thrust bearings are unnecessary, for a bit of end motion in such a case is harmless.

Thrust Pillow Blocks. Occasionally unnecessarily complex machine design has been done to eliminate end thrust or motion, when the use of a thrust pillow block would have readily solved the problem. One pillow block which has been developed for thrust duty, incorporates a heavy-duty ball bearing to take the thrust load and a roller bearing to carry the radial load. Even babbitted pillow blocks for slow speed units have been known to take up end thrust of a shaft, and with little frictional contact. This is done in the case of one such pillow block by making it with a closed bell end through which an adjusting screw is placed and fitted with a lock nut. Inside the pillow block, a spherical-faced plug is advanced by the adjusting screw, to bear against an opposed, spherical faced button that bears against the end of the shaft. A set-screw is also provided to lock the spherical faced plug, so that it cannot rotate after it has been properly adjusted. Thus, all end thrust can be closely controlled, yet the only frictional contact at the end is represented by the meeting of the two spherical faces. Theoretically, there is only point contact. Practically, there is not much more than that.

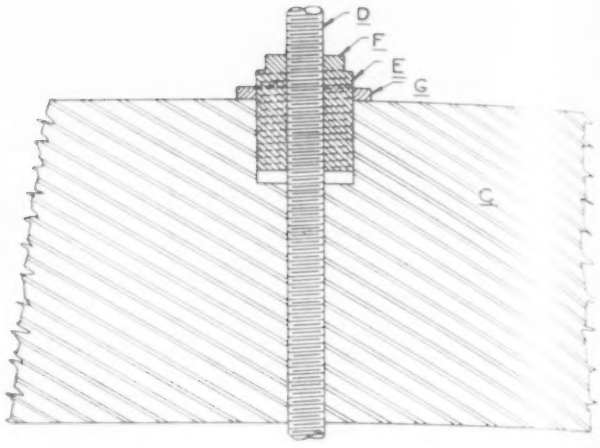


Figure 4, a method for compensating for continual thrust on threading.

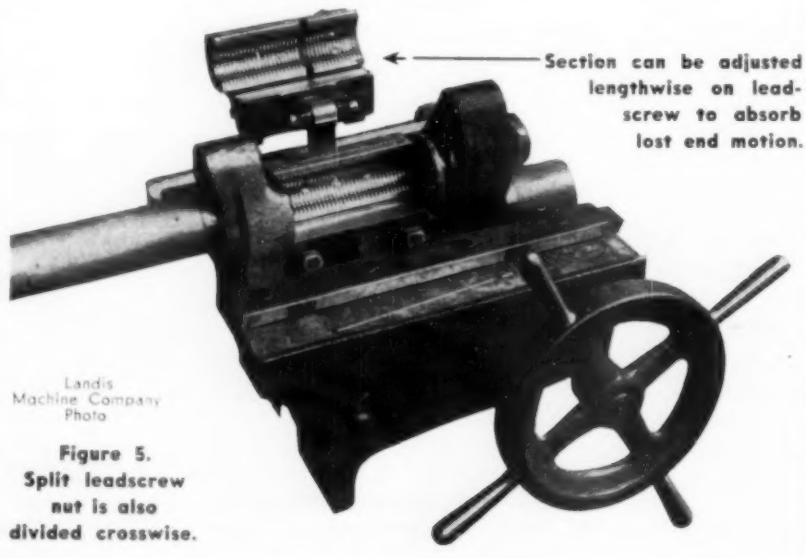
Sometimes considerable allowance is necessary for end motion due to expansion, sudden shocks of end thrust type and suddenly-imposed heavy loads causing distortion. Various bearings have been designed to take care of such exigencies. One roller bearing has an inner race with a double lip, but the outer race is free from lips or shoulders, so that the rollers can move across this outer race if sudden end thrust must be absorbed. Roller bearings of this type have been available with roller cages made of either steel or brass.

Springloaded End Thrust. There are places in machine design where a thrust bearing of spring-cushioned type is useful. Such a bearing prevents all end motion of the shaft due to thrust, unless that thrust builds up to the point where the spring will yield. This has been found useful in the design of a universal tool grinder.

A thrust bearing with a spring cushioning device is used when grinding tungsten-carbide tools on the face of a cup-wheel. A light, even pressure being necessary, the resistance of the spring is such that the predetermined amount of pressure cannot be exceeded, or the spring will yield. When grinding tools other than tungsten carbide, this cushioning device may be locked, so that much heavier cuts may be taken, and greater pressure exerted.

End Thrust Wear Compensation. Continued end thrust will always cause wear on collars or on other shaft-retaining elements, but recurrence of thrust is especially wearing because pounding is set up. As clearance developed by this wear and pounding increases, the pounding becomes more severe and the wearing rate is accelerated. At least one device has been perfected to compensate for such wear as it occurs, by providing an automatic takeup.

This device, which looks something like a small collar or spacing ring, is made up basically of two mating members of helical-faced cam type, which expand in their aggregate thickness when rotated one upon the other, in the proper direction. Such rotation, properly controlled, is the basis of the automatic takeup. Through an ingenius system of springs, control ribs and pins, there expansion and adjustment increases at the rate in which wear occurs to make it necessary. Known as a compensator, this device can be set to take up wear in increments of 0.001-inch, or in other convenient amounts, and it is claimed that any specified bearing adjustment can be held within 0.00025-inch. The



Landis Machine Company Photo

Figure 5. Split leadscrew nut is also divided crosswise.

adjustment may be as snug or as free as the designer may specify.

End Thrust Wear on Screws. While end thrust is thought of chiefly as applying to shafting and spindles, it also takes a heavy toll on threaded parts, often destroying accuracy and disturbing adjustments. Compensation for a continual thrust against first one side of the threading and then the other often takes the form of an adjustment which permits the screw to be held in a moderate amount of tension in the working area. Such an arrangement should bear on both sides of the threading, thus eliminating loose play caused by wear.

A good method of doing this, usually available to the individual designer, appears in Figure 4, where a threaded screw D passes through the part C which is internally threaded to receive it. The hole in C is counterbored, and the counterbore is internally threaded to receive a bushing that is threaded both internally and externally, as E. The bushing E is squared off at the top end as at F to allow application of a wrench, and a lock nut G is provided on E to hold it at any set point. The dotted external threading indicated on E is to be thought of as appearing on the near side, or the part that has been broken away, thus giving it the same direction helically as the threading shown on the screw D.

Such a bushing will always serve, by revolving it on D while D is at rest, to take out any loose play, so long as the bushing has a different number of threads per inch externally than internally. A differential must exist to make it effective, but the nearer to zero that differential is, the finer is the takeup adjustment.

There are other methods of bringing the same general mechanical principle into use, so that two parts of a female thread assembly may be moved axially in relation to one another for the same purpose. On a threading machine this principle has been used, though by a different designing method, to compensate for end thrust wear on the lead screw.

In addition to splitting the lead screw nut lengthwise, to provide for disengagement of the nut from the lead screw, one of the two halves of the nut is divided crosswise. This can be clearly seen from the view of this split nut in Figure 5. The screw, in operation, is housed in the tube at the left, and it works through the nut. This layout provides a third half-nut at H, which can be adjusted lengthwise on the screw, in whatever amount may be required to take all end motion out of the screw, and maintain perfect accuracy. The net result is precision threading.

Where it is imperative, for good results, to maintain even cutting tool pressure at all times, as in some kinds of lathe work, the take-up of all lost end motion in a lead screw should never be overlooked. There is the possibility of maintaining constant rigidity and even pressure by employing hydraulic feed of the closed circuit type. One automatic lathe equipped with a closed circuit type of hydraulic feed has been used for machining tough alloy forgings with tungsten carbide tools. Rigidity in the work-supporting spindles of lathes is important, but the finest kind of work support means little or nothing if end thrust is allowed to set up lost motion in lead screw or feed.

Thrust-Free Elements. The choice of elements used in a machine may have much to do with avoiding thrust troubles. One of the simple cases in point is the clutch. Though the cone type of clutch is convenient for many applications, and widely used, its use inevitably involves considerable end thrust on the shaft or sleeve on which it is mounted. A band-type clutch will not produce any such thrust.

Where elements must be used that are known to produce considerable end thrust, they may sometimes be so arranged that two thrust-producing elements will counter or in some degree neutralize one another. For example, a shaft on which a worm is mounted, driving a worm-wheel tends to thrust endwise when it goes into operation. If a cone clutch is used on the same shaft, having its thrust direction counter to that set up by the worm, the effect of the cone clutch thrust may be beneficial.

Interesting Case of Counter Thrust. Counter thrust may be applied by degrees, depending on what facilities may be available to the designer. Such an application can meet the problem common to lathes of any type in which work is held between centers by pressure. On large rotary veneer lathes, used for holding logs between centers and reducing them to veneer by the uniform approach of a large veneer knife held in parallel with the axis of the revolving log, the leverage and mechanical purchase obtained by the cutting edge on large-diameter logs demands heavy center pressure.

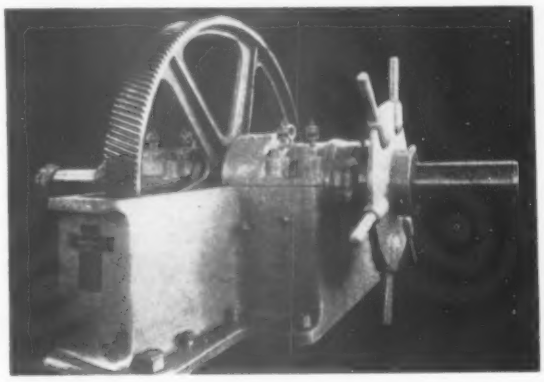


Figure 6, one headblock of a veneer lather. Upper housing removed. Spiral tooth gear drives one end of spindle.

Opposed spiral at other end of spindle helps counter end thrust built up by pressure required to center heavy logs.

Merritt Engineering & Sales Company Photo

The end thrust set up in the dogging or log-mounting operation is taken on tapered roller bearings, which also carry the radial load. The spindles at both ends of the machine are driven by large gears contained in housings.

Figure 6 shows the headblock, with the upper half of the gear housing removed, to reveal the spiral toothed gear that drives the spindle. In the tail block at the opposite end of the machine is another spiral gear, with its teeth in opposed formation. These gears produce a considerable amount of end thrust in the lathe spindles as they run, and they are designed to counter the thrust produced in the spindles and against the main bearings through dogging the log between centers. Therefore, the thrust developed by these spiral gears, being "logward," considerably relieves the great pressure or thrust which builds up endwise against the bearings.

THE END

Three Reamer Applications That Have Aided Production

PRACTICAL IDEAS EVOLVED BY METHODS MEN

• TO STRAIGHTEN HOLES

HOLES in which the axis should not be bowed more than .0001 inch in 4 inches can be obtained with a fast spiral reamer developed by Howard Fancher, a General Electric methods man. Enlarging the hole approximately .002 inch, it is especially useful in producing straight holes through

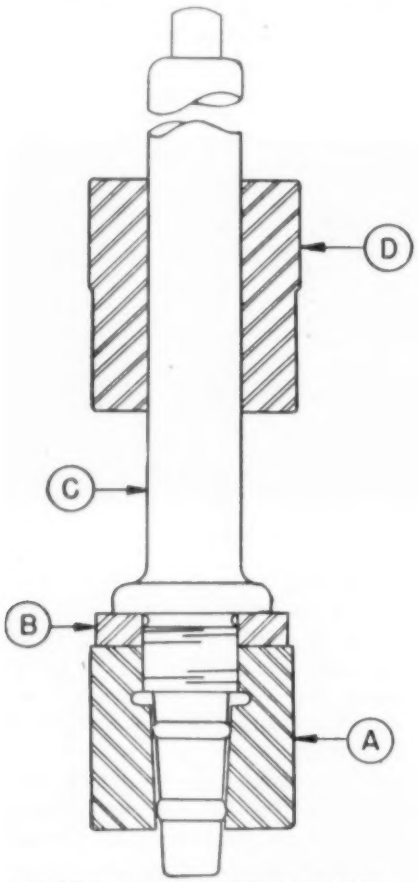


FIGURE 1. Sizing reamer for holes in restricted locations.

which rows of cross holes have been drilled.

Easily made and sharpened, the tool's cutting edges hold up well. Left-hand spiral flutes are shaped like a buttress thread. One, two and three flutes have been used.

Lands are interrupted by a right-hand triple-spiral flute with 1½ threads per inch. They are not relieved and up to .012 inch width land is permissible. The radial face of the left-hand spiral flutes is toward the starting end of the reamer, and is ground with a 5° positive rake. Only ¼ inch of length is straight and to size. The next 2 inch portion is tapered .0017 inch into the starting end. The next 3.4 inch portion is tapered .0003 inch smaller.

Both straight and tapered portions are cylindrically ground. The fluted shank, which acts as a back pilot or guide, is cylindrically ground .0005 inch smaller than finish diameter of the reamer teeth. Its flutes facilitate the flow of cutting oil. For a reamer of approximately ½ inch diameter, a left-hand thread of six threads per inch and a triple right-hand thread of 1½ threads per inch have worked.

• FOR HOLES IN RESTRICTED LOCATIONS

A PRODUCTION tool devised by Henry Bernadt, also a G. E. methods man, quickly and accurately reams holes difficult to reach with scrapers. It is shown in Figure 1.

The unit is first disassembled, reducing diameter about .002 inch. Reamer (A) is inserted in the hole to be finished, and tightened against washer (B) by a twist of arbor (C). This expands the tool to proper diameter and reams to correct tolerance in one turn. "D" is a guide.

Cutter wear is offset by decreasing thickness of the washer, permitting the arbor taper to further enter the cutter. Reducing washer thickness .001 inch expands the reamer .0001 inch.

• FOR BALL-BEARING FITS

AN EXPANDABLE sizing reamer, Figure 2, also developed by Bernadt,

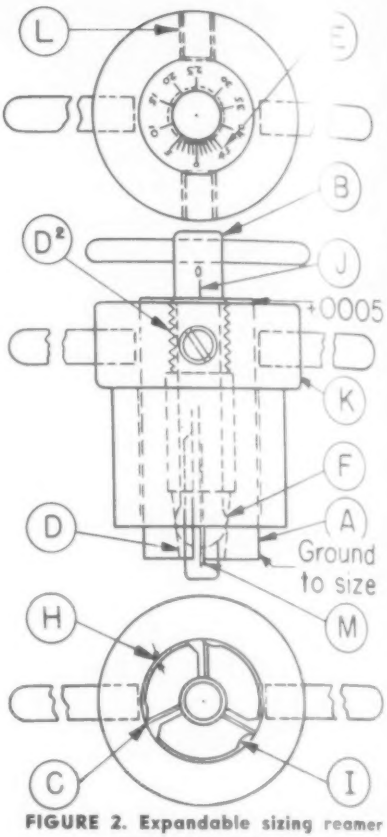


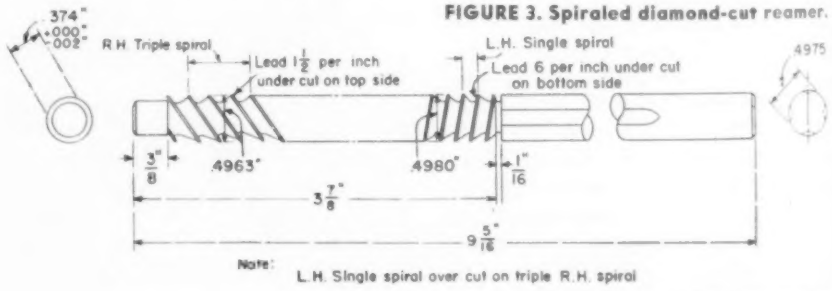
FIGURE 2. Expandable sizing reamer for ball-bearing fits.

quickly reams holes in ball-bearing housings. Holes bored .001 to .002 inch under size are finished with the reamer to .0002 and .0003 inches. About .0005 inch is cut per turn. G. E. has sizes ranging from ½ to 6½ inches in diameter.

Micrometer adjustment provides 50 equal divisions. In setting up, screw "B" is retarded about one turn, inserted into the bore and expanded to the proper diameter, which is governed by graduations "E" and reference line "J."

The proper line is established by the first hole, reaming a little at a time. The following holes will be duplicated when adjusted to the same line. In this operation, the tool is first

FIGURE 3. Spiraled diamond-cut reamer.



reduce in diameter and inserted into the bore of a trial piece. Then it is expanded and the proper index number on the dial is established for the finished tolerance. The reamer is made ready for use in this manner.

Reamer "A", made of a good grade of steel and adjusting screw "B", made of tool steel, are hardened and ground. Three flutes "C" are milled to eliminate chatter. The taper of hole "D" is .1 inch in diameter to one inch of length, and the screw has 20 threads (D^5) to the inch. This gives an adjustment of .0001 inch expansion to each division (E). Balled part "F" governs adjustment.

Before grinding the O. D. of "A", it must be expanded about .005 inch and kept under tension while grinding on screw "B". The cutting end is ground to the desired diameter and the other end about .0005 inch plus, to prevent "undercutting." Clearance "H" back of rake "I" is reduced about .0003 inch on a side to prevent excessive expanding and help keep the reamer in line.

Sleeve "K" is used as a driver and as a stope when the depth of bore must be sized by facing cutting edge "M." Screws "L" are for sleeve adjustment.

Thread Grinding Fixture Salvages High Speed Steel End Mills

G. LETSCHE

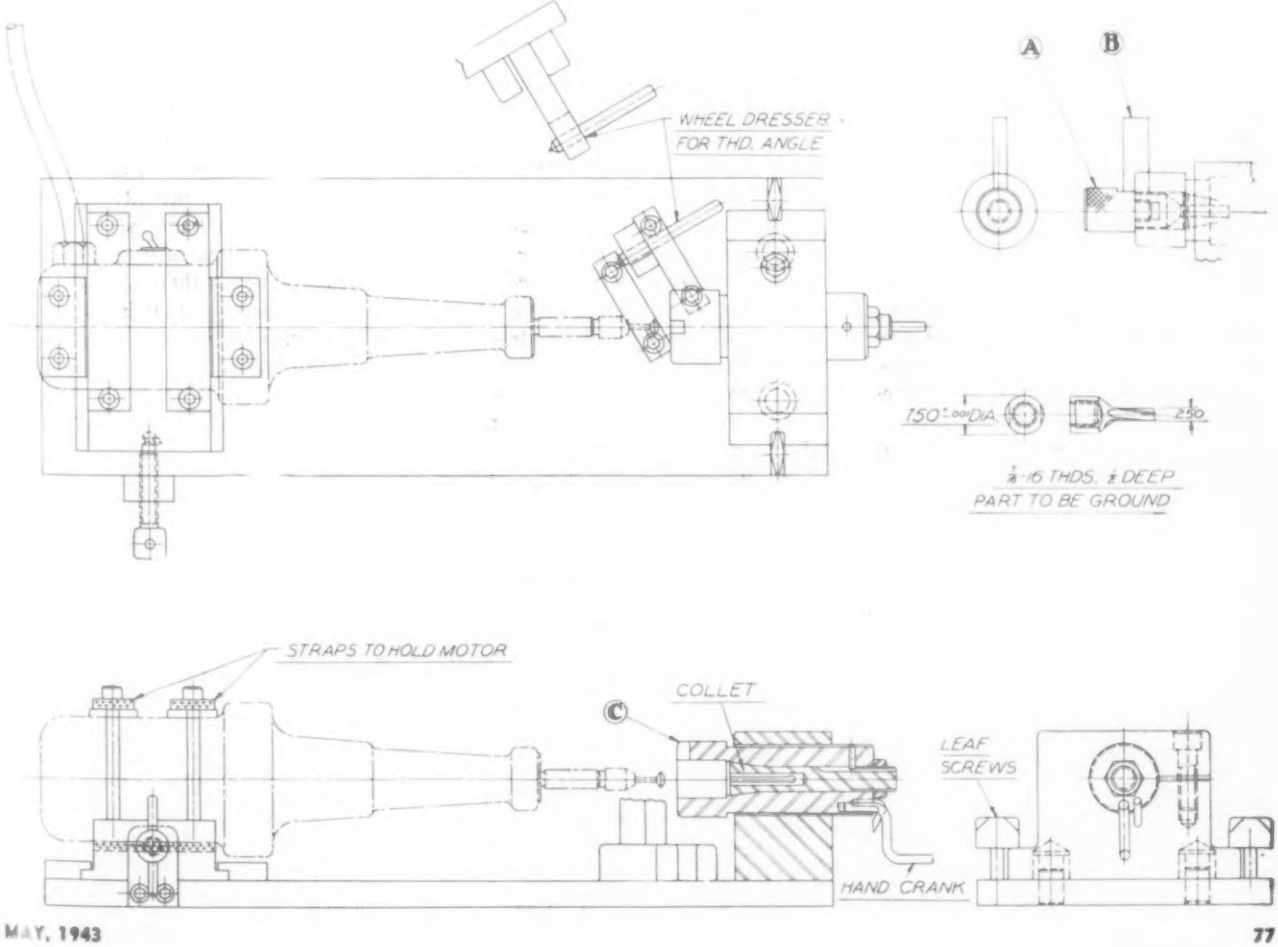
SUPERINTENDENT
VULCAN TOOL COMPANY

THE thread grinding fixture shown in the drawing below has been successfully applied to salvaging 700 high speed steel end mills. The 7/16-16 thread was .003-.004 inches undersize and the full depth of thread ⅛ to ¼ inches short.

As shown, a standard hand grinder is mounted in a cross slide. A wheel dresser for dressing thread angles of the wheel is indicated. On the outside diameter of detail C a 16 USF thread feeds the end mill into the grinding wheel. The method of holding the end mill is shown in the detail of the collet (C).

The fixture is located on dowels and can be removed quickly for checking size of thread. For locating the thread to catch the pitch line on each end mill, the shoulder thread plug (A) is screwed into the end mill and when placed in the collet, the shoulder is pushed against the end of C. Part B, fitting into a slot on C locates the threads radially when pushed against the flat on A. The collet nut is then tightened and the thread is located and ready to grind.

THE END.



Latest Developments in GLASS GAGES

• Last-minute notes on practicability, designing and machinability—with consideration of physical characteristics of glass, and photographic studies of other industrial uses for glass which gaging success has stimulated.

T. J. THOMPSON
CORNING GLASS WORKS

DURING the relatively brief interim since Lt. Col. J. A. Stone, Executive Officer at Frankford Arsenal, first focussed attention on the possibilities of glass gages for Ordnance requirements, comprehensive studies have been made to find the best glass for the purpose. Glass is largely composed of the oxides of metals, rather than the metals themselves. And because practically every known metal is used in one type of glass or another, an almost infinite variety of glass compositions, characteristics and properties is available.

In metals, hardness affords a reasonable criterion of relative gaging durability. But glass differs from metals in many respects among which is physical structure; it is non-crystalline. Therefore, it differs from metals under certain types of abrasion. When metals are polished, for example, the microscopic "peaks" soften and smear to form trailing slivers overhanging the valleys. But when glass is polished with rouge, for example, the peaks appear to melt down and raise the level of the valleys, giving a "glass-smooth" surface. It is conceivable that this accounts for some of the spectacular durability which glass has demonstrated in some gaging service.

Rather than "hardness" being considered the most important single property for glass in the form of gages, "toughness" more nearly describes the ideal combination of wear properties. But even it does not account fully for other factors such as coefficient of friction which may be important.

Available data on service-testing or several commercial glass compositions, supplemented by laboratory test-results on a comprehensive variety of specially formulated glasses has made it possible to narrow the field and select one which merits adoption as a preliminary standard. This glass is called Corning No. 008. Not only hard and tough, it has an expansion coefficient of 51 x 10^{-7} in/in° F., well within the tentative specifications of .0000040" - .0000060" set by the Ordnance Department. Also, it is chemically stable against corrosion and has good grinding characteristics.

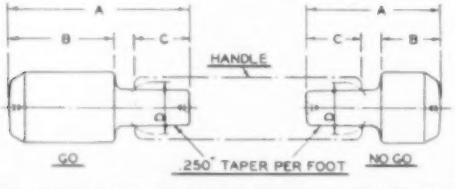
Actually, the toughest glass we know of at the moment is "Pyrex" No. 774, the same composition which in the form of piping and centrifugal pumps withstands easily some of the worst combinations of hot, strong acids and abrasive slurries in the chemical industries. The expansion coefficient of this glass (.0000018 in/in/°F.), however, is considerably below the tentative standard adopted by the Ordnance Department. Nevertheless, there is a growing feeling that many gaging operations are carried out under such well controlled conditions that a major difference in expansion of the gage and the metal part would be of little significance. Gage blanks made from this glass will be made available to those who can take advantage of its extra toughness. Again, it is emphasized, however, that this glass is below the Ordnance Department's tentative specifications for expansion coefficient.

DESIGN OF GLASS GAGE BLANKS

The Ordnance Department is collecting data preliminary to establishment of suitable standards of design of glass gages. Experience gained in use of such gages has led to the belief that it is possible to closely approximate the basic design features described in U. S. Department of Commerce Commercial Standard CS8-41 (Third Edition). The necessary modification of these standards for the purpose of facilitating finishing operations on the glass gages and to assure good performance in service, is well under way in collaboration with gage makers and officers of the Ordnance Department.

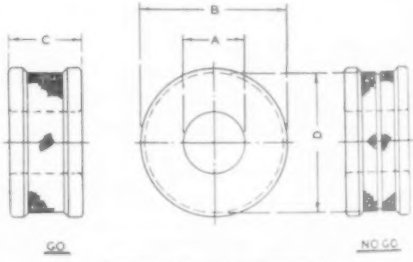
PLUG GAGES

Initially, the size range of plug gages will be between .365" and 1.135". Larger sizes will be made available later. For these sizes, up to 5" diameter, cylindrical reversible plugs, probably permitting use of standard tri-lock handles, will be used. The rounded nose of glass plug gages largely prevents their use for blind-hole gaging. As yet, it is not considered feasible to make the leading end with the sharp corners required for this because of the possibility of chipping. It may be, however, that temper-



CODE NO.	HANDLE SIZE NO.	RANGE IN DIAMETER ABOVE	RANGE IN DIAMETER TO AND INCLUDING	GENERAL DIMENSIONS GO A	B	C	D MIN.	D MAX.	CODE NO.	GENERAL DIMENSIONS NO GO A	B	C	D MIN.	D MAX.
77102	2	.365"	.510"	2 1/4"	1 5/8"	3/4"	.309"	.310"	77150	1 5/8"	5/8"	3/4"	.309"	.310"
77103	3	.510"	.675"	2 1/2"	1 1/2"	3/4"	.408"	.410"	77151	1 3/4"	3/4"	7/8"	.408"	.410"
77104	3	.675"	.825"	2 1/2"	1 1/2"	3/4"	.408"	.410"	77152	1 3/4"	3/4"	3/4"	.408"	.410"
77105	4	.825"	.975"	2 5/8"	1 5/8"	7/8"	.608"	.610"	77153	2 1/8"	15/16"	7/8"	.608"	.610"
77106	4	.975"	1.135"	2 5/8"	1 5/8"	7/8"	.608"	.610"	77154	2 1/8"	15/16"	7/8"	.608"	.610"

Left: **Design and specifications of Corning Plug-Gage Blanks. The pilot construction increases chip resistance.**



CODE NO.	A RANGE ABOVE	A RANGE TO AND INCLUDING	GENERAL DIMENSIONS B	C	D
77050	.365"	.510"	1 3/8"	7/8"	1 1/8"
77051	.510"	.675"	1 3/8"	7/8"	1 1/8"
77052	.675"	.825"	1 5/8"	1 1/8"	1 5/8"
77053	.825"	.975"	1 5/8"	1 1/8"	1 5/8"
77054	.975"	1.135"	2 1/8"	1 1/8"	2 1/8"

Right: **Design and specifications of Corning Ring-Gage Blanks.**

ing of ... blanks may improve chip resistance.

RING GAGES

Contemplated designs of glass ring-gage blanks conform closely to existing metal gage standards. For greater strength, thickness is somewhat greater than corresponding metal blanks. And to assure positive grip or "feel," the peripheral surface has been stippled.

PLUG GAGE FINISHING

Center-drilling: For drilling and counter-sinking center holes, tungsten carbide triangular drills work rapidly and well, using turpentine as a lubricant. Drill speed—500 to 1000 rpm. Attempts to drill too fast will result in spalling or breakage.

Diamond drills are better than tungsten carbide. And counter-sinking can be effectively done with suitable silicon-carbide cones instead of tungsten carbide.

Center-lapping: Diamond laps are far superior to other abrasive lapping sticks, although a reasonably satisfactory finish is obtainable with the latter.

Mounting on centers: For rough graining or finishing to rather generous tolerances, live centers are satisfactory and preferable. For close tolerances, however, dead centers will probably be necessary.

A paste of white lead and light machine oil is an excellent lubricant.

Steel centers don't stand up very well against glass even when the center holes are well lapped. (This is another indication of the abrasion resistance of glass vs. metal.) Tungsten-carbide centers are, therefore, preferable.

For several reasons, it is desirable to use the lowest possible centering force when mounting glass plugs in the grinder. Use only enough pressure to assure rotational stability. This not only minimizes the possibility of breakage, but, also, reduces wear on the dead center; furthermore, it cuts down heating and reduces elastic distortion under columnar loading.

Originally, it was believed that wheel speeds must be held under 2500 sfpm. to prevent sparking or "firing" and consequent "checking" of the glass.

This is still considered safest practice. However, if the supply of coolant

Hardness, smoothness and abrasion resistance of glass is utilized in producing a precision finished roller, ball-bearing mounted. These are the qualities so important in gages.

is abundant and well distributed speeds up to 6000 sfpm. can be employed, and depth of cut can be upwards of .030" when necessary; lighter cuts of .003" to .005" are safer and therefore advisable, initially at least. Wheels of 60 to 80 grit work well for the preliminary roughing but the bond should be soft. Some manufacturers of abrasive wheels believe very fine grit — upwards of 220 — is preferable where it is necessary to operate at wheel speeds approaching 6000 sfpm. Work speed should be 90 — 120 rpm.

For coolant, water plus a small amount of rust-inhibiting soluble oil is entirely satisfactory.

After roughing to within .003" to .004" of finished dimension, the finishing wheels of 150 or 180 grit or finer are employed. Work speed should be reduced to as low as 25 rpm. Best results have been obtained to date with wheel speeds between 1000 and 2500 sfpm. and very slow traverse on the final passes.

When within .0003" to .0004" of finished dimension it is safe to shut off the coolant, provided the finishing cuts are only .0001" deep or less. This not only eliminates the scratching which might result from entrained particles in the fluid but also aids in assuring a polished finish. The frictional heat thus generated at the surface of the glass during the short period of dry-grinding apparently causes partial glazing. The resultant finish is, therefore, smoother and more durable. It has been found possible, incidentally, to finish within tolerances of .0001" by this method without lapping.

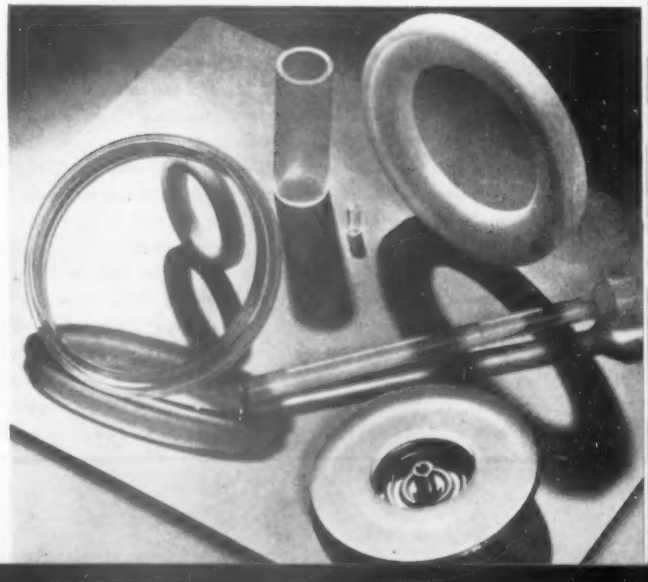
Our experience to date with diamond wheels is limited. The Norton Company, however, believes it feasible to grind glass to a stop with diamond wheels within .0001" and attain a surface finish of one micro-inch (generally considered equivalent to "black-finish" in steel).

In mounting and grinding glass, always bear in mind that it is much stronger than steel in compression but much weaker in tension or shear. It follows that the strains incident to mounting in "dogs" and on centers, should be kept at minimum. Also, glass will bend three times as far under a given load. Consequently, the work should be allowed to "die out" completely during the final passes to prevent taper resulting from elastic deformation caused by side thrust on the work by the wheel.

Finishing to tolerances less than .0001" will probably require lapping. The procedure and equipment for this need not be different from metal-finishing. But since a highly-polished finish seems to enhance the durability of glass, rouge might be preferable to the fine abrasives ordin-

Because of a slightly high expansion coefficient, by Ordnance Department standards, "Pyrex" has a limited applicability to gaging at present.

However, it is suitable to such precision parts as are shown here — a valve plate, pump plunger, rotary seal rings for centrifugal pump and precision bore tubes.



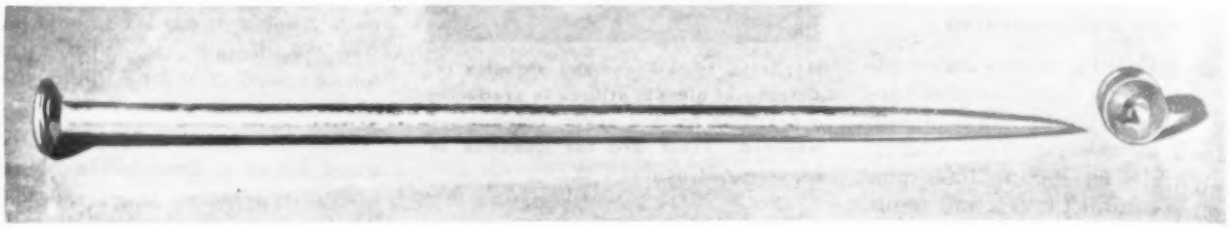
arily used on steel.

Ring gage finishing: Many of the above noted comments on plug-gage-finishing also apply to ring gages.

Mounting in grinder: Since glass is non-magnetic, mechanical clamping devices will be required rather than magnetic chucks. The cylindrical design of the glass blanks is husky and strong enough to permit conventional chucking at the periphery. It is preferable, however, to clamp against the face of the blank. This eliminates any possibility of distortion affecting the bore.

In general, the shape and design of glass ring gages assure substantial mechanical strength. Nevertheless, it is again emphasized that clamping stresses should be held to a minimum. Apply just enough force to assure rotational stability. On the larger sizes, "point loading" can be mini ed by using thin hard impregnated per or composition sheet between jaws and the work; for the smalle es up to 2" this is unnecessary.

The molded glass blank w carry a small radius at the ends of bore, but additional chamfering or eling will be required after the gag is finish-ground. A rounded bevel i referable from the standpoint of hip-re-



Glass jewel bearing, compared to a common pin, used as a satisfactory substitute for sapphire, in sensitive instruments.

PHYSICAL CHARACTERISTICS OF GLASS

• HARDNESS

Glass is hard. Some indication of this is demonstrated in its use as a small jewel bearing for instruments such as ammeters, and voltmeters. The little steel pivot which seats in the bearing has a radius of only .001" at the point of contact. Therefore, a light load on the pivot, measured in ounces, results in local fiber stresses amounting to hundreds of tons per square inch. And when a plane lands, the instrument bearings are given an enormous jolt. The only material considered hard and strong enough for such jewel bearings, before the war, was sapphire. But, sapphires were not obtainable in the required quantity. Could a satisfactory substitute be made from glass? The answer is "Yes!"

Actually, glass jewel bearings are not nearly as hard as sapphire but they are hard enough to outwear the tiny, hard steel pivots. Instrument makers, therefore, plan to use them widely after the war because they are strong enough for most purposes and much cheaper than sapphire. The glass composition from which they are made is tough and resistant to abrasion. Another important property of glass is its enormous compression-strength; it withstands more than 100,000 psi. Few materials can equal it in this respect.

• MECHANICAL STRENGTH

An ordinary well annealed glass rod of about ½" diameter, deeply scored on the surface, will flex and break easily. Another rod, to all appearances identical with the first, cannot be broken with fairly strong hands. Why the great difference? Annealed glass has tensile or flexural strength up to 10,000 psi—quite low compared to steel. After annealed rod is notched with the file, it is easy to exceed this stress. The strong rod, however, has been "tempered," meaning that it has been heated beyond the point where it begins to soften; then quickly plunged into a cooling medium such as air or molten salt or oil. This carefully controlled heat treatment chills and solidifies the outer skin while the inside remains plastic. Then, as the whole piece cools, the hotter inside glass has to shrink further than the frozen outside layer, and in its attempt to do so the inside pulls the outside into great permanent compression. Consequently, when a flexural load is applied to the rod, it must first overcome the frozen-in compression before a tensile force is exerted, and the tempered rod is, therefore, much stronger than annealed glass. Tempering does not, however, measurably increase "hardness."

A snap gage blank, made by the Blue Ridge Glass Company, Kingsport, Tennessee, has been tempered and is quite strong. It was made, incidentally, by cutting from plate and it is said that blanks can be supplied in a wide variety of sizes finished to tolerances of several thousandths of an inch between jaws, thus simplifying the work of the gage maker in finishing them to gage specifications.

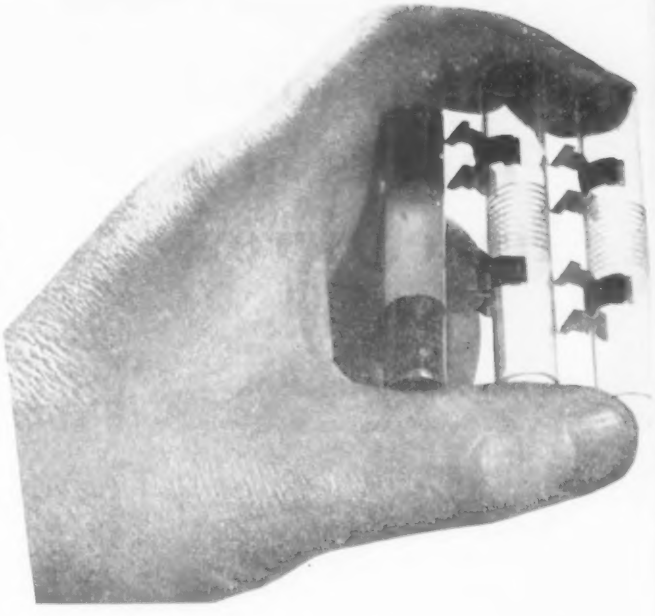
Ring and plug-gage blanks can be tempered also, but it is important to remember this: don't remove more than .020" from the surface of any tempered glass blank! A deeper cut exposes the weaker tension zone. In fact, cut deeply enough and spontaneous rupture will occur. Obviously, this limitation of .020" maximum depth of surface removal, would make it necessary to supply tempered blanks in .035" increments in diameter. It would be impractical at the present time to make the number of molds necessary to produce blanks in such small steps of diameter, but it would be a simple matter to grind larger annealed blanks to the desired size and temper them at the glass factory. Later on this may be done but at present, we have not obtained delivery of the grinders required for such preliminary rough finishing. Consequently, our blanks will be available in the annealed state, only, for some time.

• ELASTICITY

Physicists say that glass is more truly elastic than steel, in the scientific sense of the term. It returns to its original shape more quickly and more faithfully than steel does after being deformed mechanically. A little glass spring, made from ordinary "Pyrex" rod, tempered, is designed to deflect 3/32" under a one pound load. Not very strong, compared with steel, but it is almost entirely immune to fatigue and strong mineral acids. After 8,000,000 deflections under full load, there is no evidence of failure.

The elasticity and elastic modulus of glass play important parts in gage making. Many glass compositions have a modulus of elasticity of approximately 10,000,000 psi, about one-third that of steel. Consequently, it will bend three times as far under a given bending load. This should be borne in mind when mounting ring gage blanks in chucks. The glass blanks are huskily designed, but reasonable care should be exercised to avoid any possibility of "spring back."

Being truly elastic, glass "cleans up" or "dies out" quickly under the grinding wheel on the final finishing passes, but, here too, care should be exercised to use the minimum of force in mounting the piece on centers or in chucks. If necessary, the centering tension should be eased to a bare minimum prior to the final finishing or polishing cuts.



Though not required in gage construction, metal can be soldered to glass.

Here, metal clips are soldered directly to thin metalized patches on threaded coil forms.

sistance and can be readily ground-in by use of properly dressed wheels. By beveling after finishing the possibility of bell-mouth is greatly minimized.

MOUNTING PLUG GAGES IN HANDLES

To assure firm, solid seating in standard steel handles, the taper-shank of plug gages should be given a rather rough finish (60 grit wheel). Furthermore, insertion of a narrow (1/8") strip or two of thin paper (cigarette) will improve the friction grip and facilitate removal of the glass gage from the handle.

When removing glass plugs from handles, care should be exercised to avoid impact. Don't use a hard metal driving-pin. Instead, use wood or a plastic rod or soft metal. This reduces "point loading" and minimizes the possibility of chipping or spalling of the end of the taper shank.

Plastic handles have enough "yield" to accommodate the minor irregularities of the mold-finished surface of the taper shank. But be sure that the metal end-pieces of the plastic handles do not project radially into the bore because the result of this will be ring-strain and breakage of the glass shank.

MARKING OF GLASS GAGES

Glass gages cannot, of course, be stamped like metal. However, they can be readily engraved with pantograph equipment using diamond or tungsten carbide points. Or, if these are not available, it is not difficult to etch with hydrofluoric acid.

STORAGE OF GLASS GAGES

Glass gages do not rust or corrode like steel; hence, they are immune to perspiration, fruit acids, etc., and do not require frequent greasings and degreasings. If, however, the glass gages are to be stored for a prolonged period of time in humid or damp atmospheres, it is advisable to apply a light film of oil.

GLASS GAGE PERFORMANCE

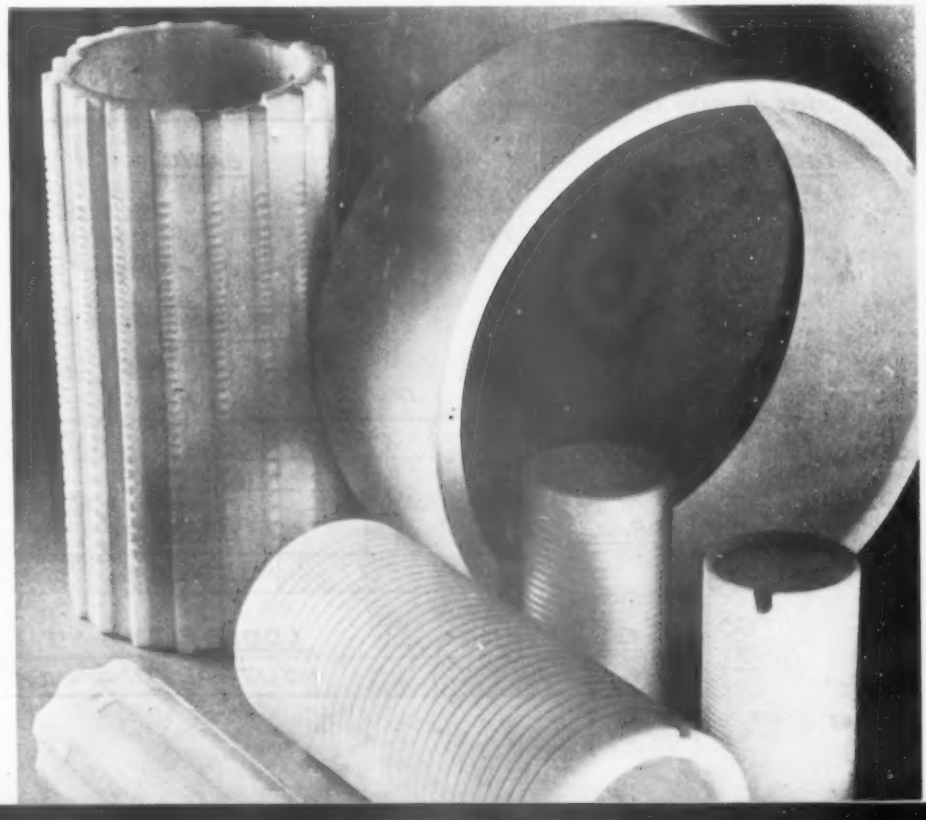
The advantages of glass gages have been widely publicized and need not be repeated here. These have included some of the more spectacular instances in which glass gages outwore steel, along with detailed performance data. Since these records were made available, reports from the field have continued to be generally favorable although sufficient time has not yet elapsed to obtain accurate data on the growing number of glass gage applications.

Along with favorable reports, some of the bad reports should be mentioned. In one instance, glass plugs used for gaging aluminum have been found to last approximately one sixth as long as chrome plated steel. This offers a welcome opportunity to try other and tougher glass compositions, and should lead to definite conclusions concerning feasibility for such service and, possibly, towards development of far-reaching improvements in design, finish or composition of glass.

In another instance, attempts to use annealed glass plugs with small radius (approx. 1/64") on the leading end for blind-hole gaging have led to "star-breaks" of the end. This is somewhat to be expected and is all the more reason to believe that sharp corner construction simply is not feasible as yet. Whether tempering will solve such problems remains to be seen.

Other troubles, caused by point or ring contact of metal to glass in handles are readily avoidable.

THE END.



In addition to moulding gage blanks, coil forms have been made available in glass through the new multiforming processes developed by Corning Glass Works. Some of the thru-holes have molded threads.

Lateral Tolerances

Dimensional Limits of Acme Screw Threads

HAROLD F. THOMPSON

TOOL ENGINEER
JOHN BATH & COMPANY

ACME screw threads are extensively used for varied applications, often having special features which make standardization difficult. After the diameter and pitch of thread have been determined it is often difficult to select and specify suitable tolerances for the particular class of fit required. Specifications for Acme threads in available reference books will not be found sufficiently comprehensive, reliable, or consistent with present day facilities for the production of accurate threads.

For these reasons it was found desirable to prepare tables which would assist in formulating specifications. These, however, are mainly for the consideration of thread tool specialists and may be reduced to formulae for the lay tool engineer. The application of these limits is illustrated in Figures 1 and 2.

For ordinary use, a clearance is provided at crest and root of at least .010 inch on threads of 10 pitch and coarser, and .005 inch on finer pitches, so that the mating parts will not interfere at major or minor diameters,

EXAMPLES

1½—4 T. P. I. Length of engagement 2¼ or less.
Basic pitch diameter 1.3750"

CLOSE FIT

Go Plug Gage	(min. nut)	Basic	1.3750	
Not Go Plug Gage	(max. nut)	1.3750 + .0081	1.3831	Formula
Go Ring Gage	(max. screw)	Basic	1.3750	
Not Go Ring Gage	(min. screw)	1.3750 — .0081	1.3669	"

MEDIUM FIT

Go Plug Gage	(min. nut)	Basic	1.3750	
Not Go Plug Gage	(max. nut)	1.3750 + .0158	1.3908	Formula
Go Ring Gage	(max. screw)	Basic	1.3750	
Not Go Ring Gage	(min. screw)	1.3750 — .0158	1.3592	"

FREE FIT

Go Plug Gage	(min. nut)	1.3750 + .0050	1.3800	"
Not Go Plug Gage	(max. nut)	1.3750 + .0208	1.3958	"
Go Ring Gage	(max. screw)	1.3750 — .0050	1.3700	"
Not Go Ring Gage	(min. screw)	1.3750 — .0208	1.3542	"

LOOSE FIT

Go Plug Gage	(min. nut)	1.3750 + .0151	1.3901	"
Not Go Plug Gage	(max. nut)	1.3750 + .0309	1.4059	"
Go Ring Gage	(max. screw)	1.3750 — .0151	1.3599	"
Not Go Ring Gage	(min. screw)	1.3750 — .0309	1.3441	"

FORMULAE:

WHEN D = NOMINAL DIAMETER
Q = LENGTH OF ENGAGEMENT
P = PITCH
T = LATERAL TOLERANCE
T' = PITCH DIAMETER TOLERANCE

1. Acme Close Fit ..... $T = .52\,(.001\sqrt{D} + .001Q + .0025\sqrt{P})$ *
   $T' = 2\,(.001\sqrt{D} + .001Q + .0025\sqrt{P})$ *
2. Acme Medium Fit ..... $T = .52\,(.002\sqrt{D} + .002Q + .005\sqrt{P})$ *
   $T' = 2\,(.002\sqrt{D} + .002Q + .005\sqrt{P})$ *
3. Acme Free Fit (Go Increments) ..... $T = .0026\sqrt{P}$
   $T' = .010\sqrt{P}$
   Acme Free Fit (Not Go Increments) .. $T = .52\,(.002\sqrt{D} + .002Q + .010\sqrt{P})$ *
   $T' = 2\,(.002\sqrt{D} + .002Q + .010\sqrt{P})$ *
4. Acme Loose Fit (Go Increments) ..... $T = .0078\sqrt{P}$
   $T' = .030\sqrt{P}$
   Acme Loose Fit (Not Go Increments) . $T = .52\,(.002\sqrt{D} + .002Q + .020\sqrt{P})$ *
   $T' = 2\,(.002\sqrt{D} + .002Q + .020\sqrt{P})$ *

* When length of engagement is greater than 1½ times the nominal diameter, increase the values .1 times for each inch increase in length of engagement.

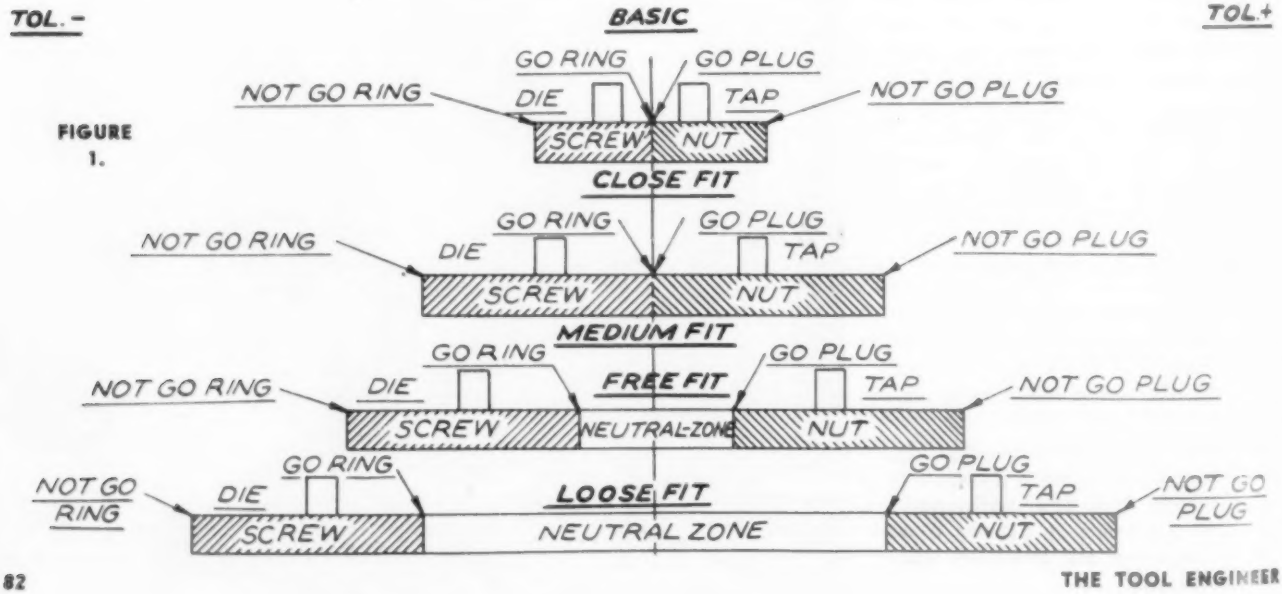


FIGURE 1.

but will have a bearing on the sides of the thread only. Other applications require a bearing on either the major or minor diameters to prevent seizure of the threads caused by the sagging of long lead screws, or to maintain alignment when transmitting vertical motion.

Major and minor diameter tolerances are not considered in this article which is based on flank clearances and which, if followed, will result in obtaining interchangeability without using closer tolerances than necessary.

Close Fit tolerances are used in manufacture of parts when no end play is permitted, and are the closest that can be successfully maintained.

Medium Fit tolerances are used in the manufacture of precision lead screws and nuts used in machine tools, and are sufficient to permit ready assembly and lubrication.

Free Fit tolerances are used in the manufacture of threaded adjusting screws for general purposes, such as valve stems and valve bushings.

Loose Fit tolerances are used in the manufacture of threaded adjusting screws for general purposes where a considerable amount of shake or end play is not objectionable, where the nuts are subjected to heat, or where ready assembly is required even when the threads are slightly bruised or dirty.

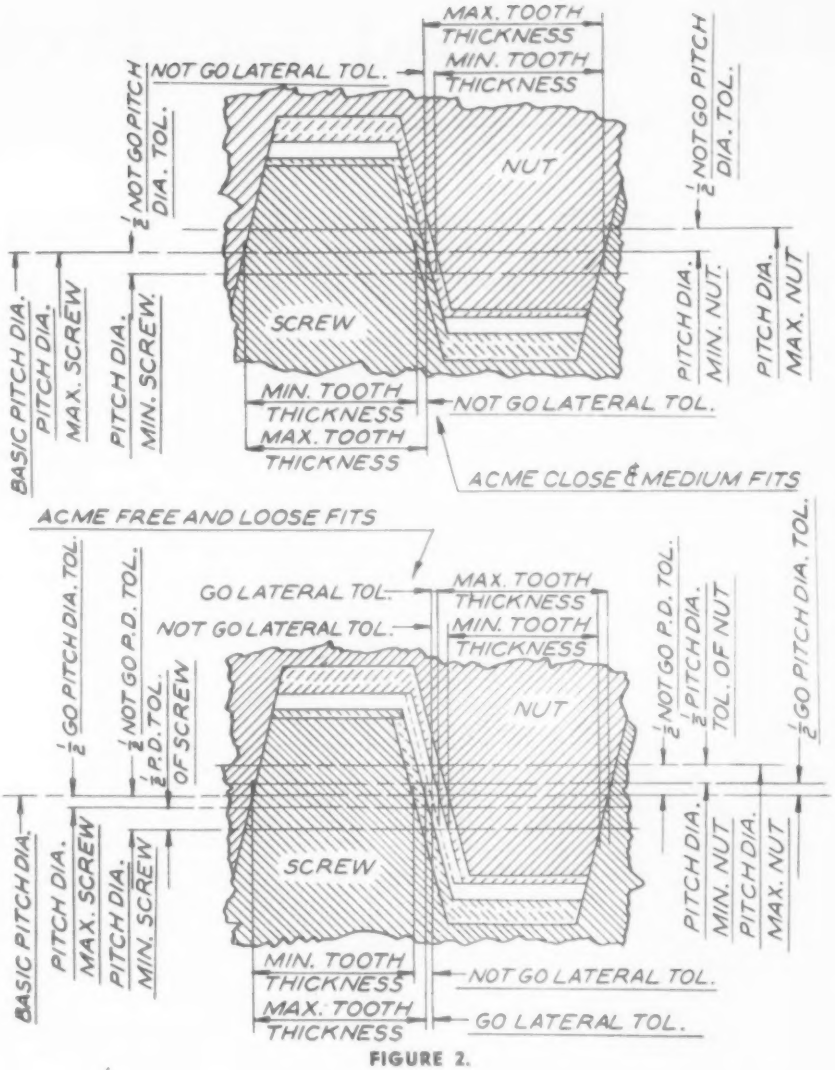


FIGURE 2.

Pitch diameters for each class of fit, and tooth widths, may be readily determined by use of formulae given and the accompanying examples show pitch diameter calculations.

THE END.

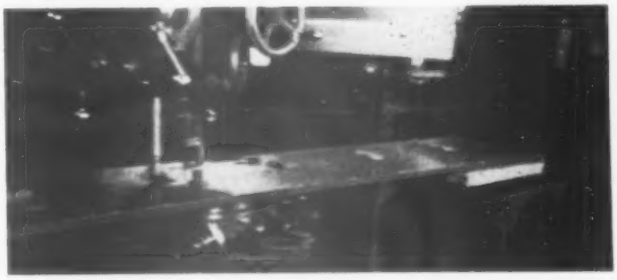
MILLING FOUR ARC-SHAPED HOLES IN AN EIGHT-FOOT PLATE

• A small but progressive war plant was faced with the problem of finishing four arc-shaped holes which had to hold to close dimensions, both as to location and size. The shop did not have a milling machine that could clear, swinging an eight-foot plate in an arc of eight-inch radius on the outer periphery, four inches on the inside, and produce a finished job.

The men who were given this problem decided that a Carlton radial drill was the machine for the job. They mounted a turntable on the bed of the radial drill, the handwheel of which can be seen at the left in Figure 1, just beneath the workpiece. The center of the arc was pivoted by a ¾-inch pin, set in the center of the turntable. An ordinary C-clamp, shown in the rear of the plate, helped hold the work on the turntable.

The tough part of the problem, after this machine tool had been selected, was to relieve the sag in the overhang of the 800-pound plate. An overhead chainfall was out of the question because of the long arc described by the end of the plate. However, an ordinary table, mounted on casters, and built up with a couple of two-by-fours, provided a rolling support.

Holes were rough drilled, as shown in Figure 2 (note arrow in foreground). A ¾-inch end mill cutter is shown in the quill of the drill, just after finishing a hole.



Above: FIGURE 1.

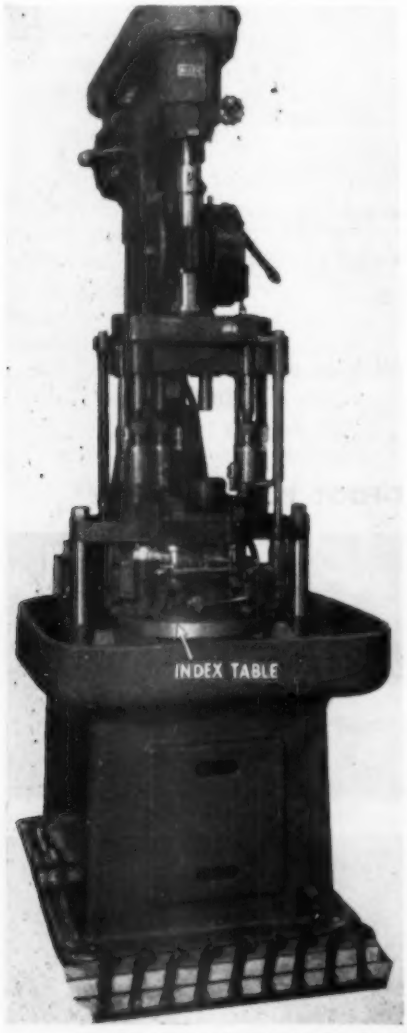
Right: FIGURE 2.

Preload for Production

AS implied in the April issue, the productive time of a machine is that interval when it is actually removing or shaping stock. The rest—as loading and disposal—is idle time even though the operator may be doing necessary supplemental work during the unproductive period. Ordinarily, the two intervals establish the productive capacity of the machine although, in many instances, this is far short of its potential output.

In this connection, the writer does not agree with the thesis that the ideal is achieved when productive and idle time balance. Rather, he contends that the ideal implies 100 per cent productivity, though concedes that this is seldom attainable and usually beyond practical bounds. Yet, where quantity and close cost competition warrant, the production engineer should strive for the ideal, provided, **that it does not impose an undue burden on the operator.** Sacrificing the operator to speed not only defeats its purpose, but reflects on engineering as well.

With modern methods and appliances, however, there are many ways to boost the potential output of machines, while conserving the human factor. Among these ways, preloading offers almost unlimited possibilities, as will be shown by typical examples in this writing. By shooting for ideals, we extend present-day averages.



Cleveland Universal Jig Co. Photo
FIGURE 1.

A. E. RYLANDER
MASTER MECHANIC
MIDLAND STEEL PRODUCTS COMPANY

THERE is nothing particularly new or novel about preloading; like most seeming innovations, it is development rather than invention. As far back as '15, the writer designed a multi-spindle "merry-go-round" drill that, running continuously, performed all the hole operations in the time of the slowest. All the operator had to do was to load the workpieces, which were automatically ejected. (Today, with modern hoppers, the whole job could have been automatic.) That job, however, was but an offspring of a venerable ancestor, with, perhaps, the refinements accruing to "the third generation."

Reduced to essentials, preloading implies the loading and discharge of a workpiece while another is in process, nor does this necessarily imply one specific operation. With station or indexing machines, it is possible, although not always practical, to process a part throughout on one machine, or, on a combination of machines arranged as a composite unit. However, we'll not go into complications, rather, will confine ourselves to simple elements.

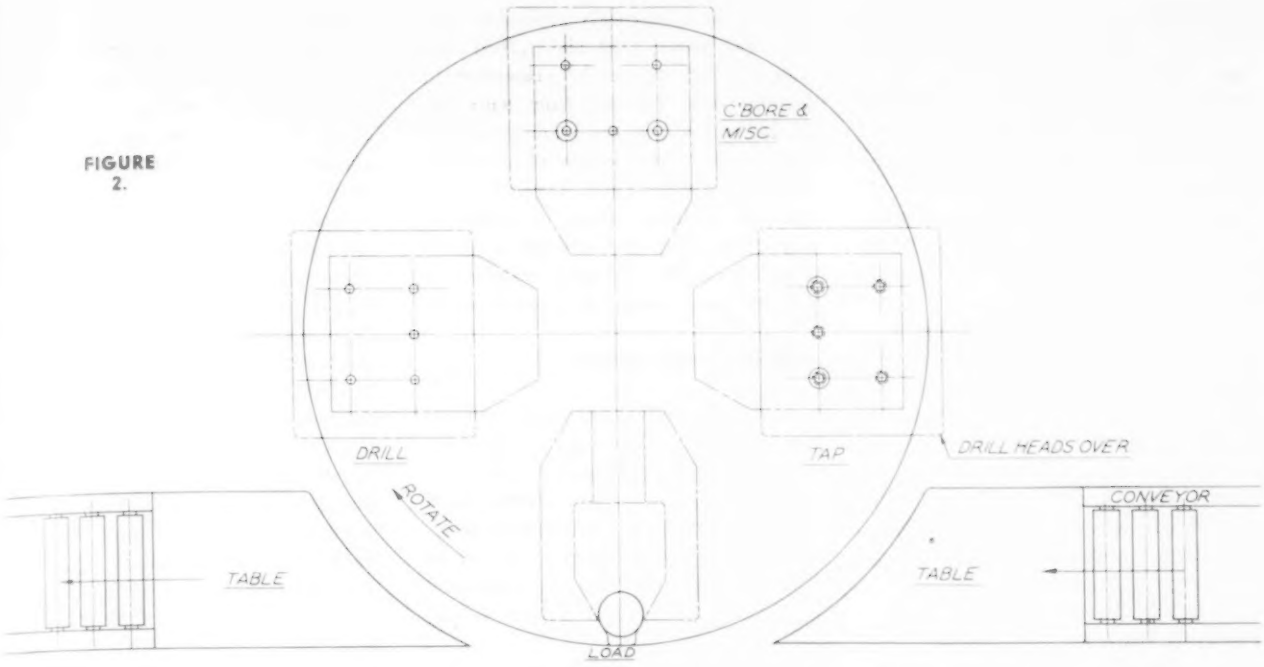
A simple scheme of preloading is shown in the index table and fixtures, Figure 1. These tables are widely used and almost universally known, have a wide range of application. On a larger scale, and used with vertical multi-drills (or single spdl.) one can drill, ream, tap and counterbore, etc., at successive stations, with no other effort on the operator's part than removing a finished workpiece and loading another. Arranged with roller conveyors and rest tables, as shown in Fig. 2, heavy pieces can be expeditiously handled.

A comparatively recent development in preloading is to be found in the rotary, index type welder. Here, an operator may assemble the component parts at one station in the interval of the down and up stroke of the ram. The turret then indexes to the welding station, where the components are joined. At the next advantageous station, the welded unit is kicked out, and so on. Of course, it does not presume 100 per cent production, since time is lost in the indexing, but it does result in a marked increase. To elaborate, such parts as clinch nuts can be hoppered (they usually are) and where shapes permit, all parts may be automatically fed, welded and discharged.

Preloading tools

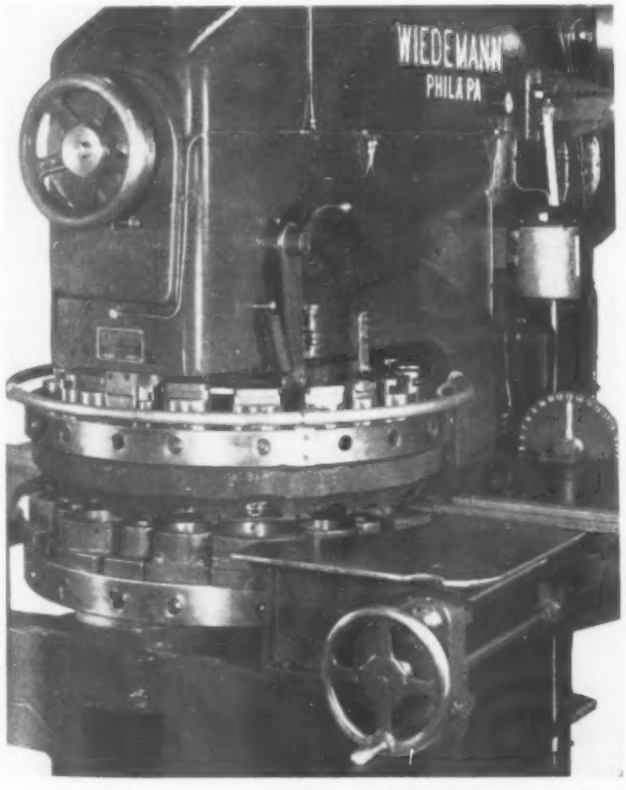
Another interesting development is the Wiedemann Turret Punch Press, of which the turret is shown in Figure 3. Here, however, is preloading of tools

FIGURE 2.



rather than of work pieces. While originally designed for short run jobs, in which the various die sets are contained in the turrets, it follows that the application can be broadened for continuous index operation. While not suited to progressive stamping—as in-line roll feed—the indexing press is a production booster on many jobs. For example, the index table was used in the automotive industry more than two decades ago for pressing in bushings, for broaching short splines and for riveting. Long before that, it was a favorite in the New England jewelry industry. The writer designed an indexing press during the previous world war for assembling armor piercing bullets; that, too, entailed manual preloading with automatic ejections. Today, as aforesaid, we'd hopper the several components and make the job fully automatic.

Refer, now, to Figure 4, showing a Newton Continuous Miller. Here is preloading on a larger scale. Furnished with one or several spindles, these machines can rough and finish mill, and even shave, while the operator loads and discharges in pace with the



Wiedemann Machine Co. Photo

FIGURE 3.

Consolidated Machine Tool Corp. Photo

FIGURE 4.

reasonable feed rate of the table. The Newton is typical of continuous milling, although the term is somewhat a misnomer since the ordinary spacing of work, and the bulk of the fixtures, often leave gaps that cannot be bridged with the cutters. With larger tables, however, and judicious staggering of work, the cutters can be made to engage one part while still milling on another.

A favorite method of preloading, on conventional millers, is the combination of several duplicate fixtures mounted on index tables of the type shown in Figure 1. With this combination, one can down (climb) or up (conventional) mill as desired, with the added feature that it is utterly safe since the operator loads and unloads remote from the cutters.

Loading tables

Another conventional method of preloading is with identical fixtures mounted opposed, with reciprocating feeds; this, however, implies down milling on one fixture and up on the opposite. In ordinary straddle milling—as finishing bosses—this imposes no hardship, and as for safety, it is only necessary to interpose a shield for the operator's protection.

Preloading was long since a feature of Beaman & Smith millers, where detachable tables were preloaded, run onto the ways, past the cutters and then slid off onto roller conveyors at the far end. Thence, they were unloaded and shunted to loading station, much after the manner of shuttling cars in a freight yard. Recently, in a midwest defense plant, a miller of that type came to the writer's attention, and while old and battered, it was still producing on a grand scale.

Handling odd shapes

Preloading offers particular inducements for odd shaped parts that cannot be quickly chucked, or where it is advantageous to gang several parts in one fixture, as in planing or milling. One such awkward part is shown in Figure 5, with set-up (in schematic outline) illustrated in Figure 6 and Figure 7. While the set-up is natural for a miller of the Newton or Ingersoll types, where one pass would suffice, it is purposely shown as a planing job. (As you know, we have to use planers now and then, even on production jobs).

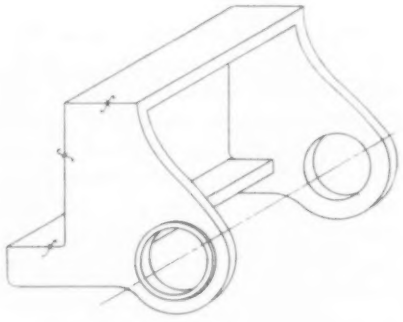


FIGURE 5.

Now, obviously, it would take a considerable interval to loosen all the clamps, unload the finished parts and reload the fixture. During that time the machine would be idle—a big item of overhead on a machine costing $25,000 more or less. But, by using three or more fixtures, the operator can not only load and unload on adjacent stands, but can "flop" the fixture so as to plane all the finished surfaces in the time of one. In other words, it is far quicker to loosen four hold-down bolts on each fixture, slide the fixtures on and off to the table-level stands, (or lift with a hoist) than to unload and chuck each part, with its multiplicity of clamps, separately. Again, there is no 100 per cent increase in production, yet the saving quickly liquidates cost of fixtures.

Help for slow chucking

Table preloading can also be employed in the case of engine and turret lathes, and grinders, especially where the shapes are such as to preclude quick chucking. In such cases, it may

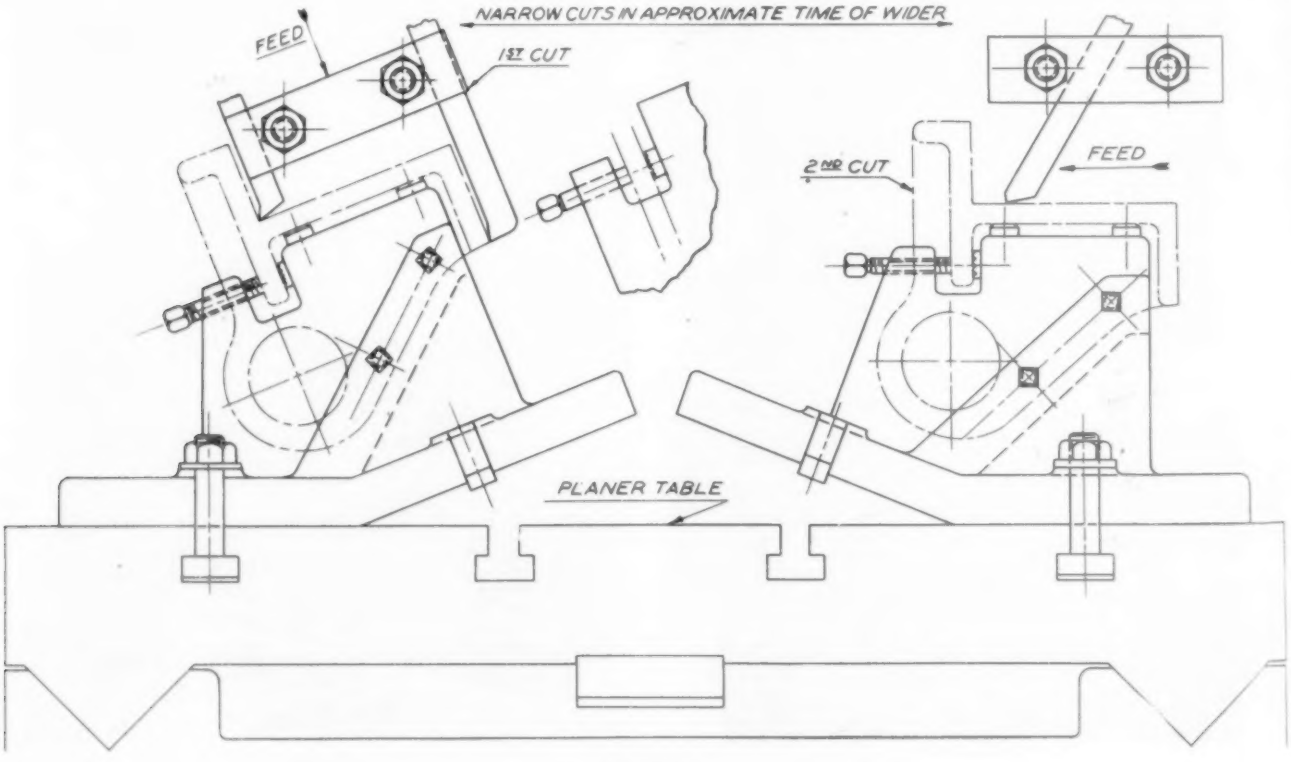
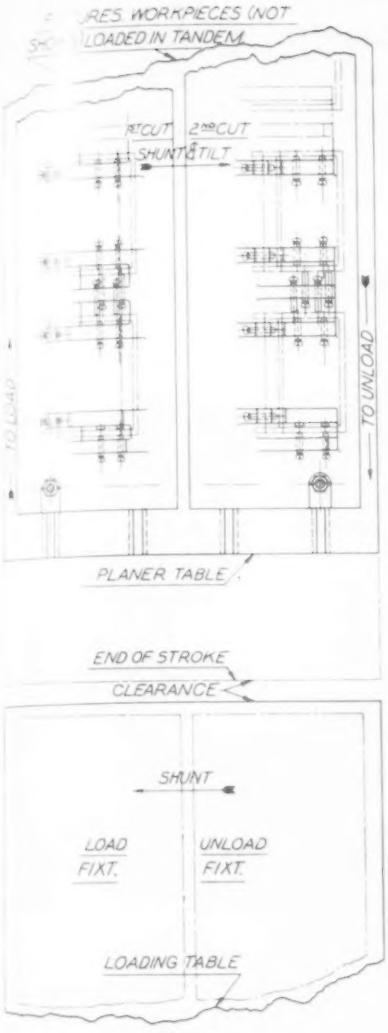
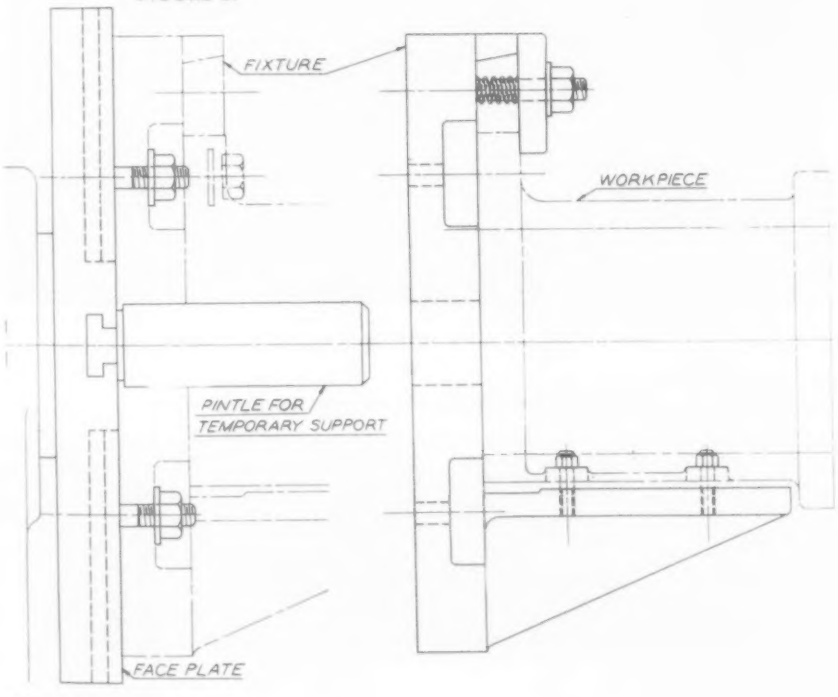


FIGURE 6.



Above:
FIGURE 7.

Below:
FIGURE 8.



be necessary to employ a loader, since (unless the machine be semi-automatic) nothing would be gained by detached loading while capital investment stood idle. However, the loader could serve several machines. Figure 8 illustrates a typical preloading fixture for any conventional turning machine; here, two fixtures would be employed, one working, one loading.

Right:
FIGURE 9.

Consolidated Machine Tool Corp. Photo

While elementary, the set-up implies bench loading and balancing of fixture and workpiece, both time consuming operations. The mounting, the fixture is safely held in place on the pintle while the part-fixture assembly is slid onto the driving pin and dog bolts.

In this connection, the writer has in mind a specific job where the actual loading time, plus balancing, required almost 10 minutes per part. Since the actual machining time was about 18 minutes, with 2 minutes for mounting and dismounting (a total of 20 minutes per piece) it is apparent that 8 minutes was saved on each run — the equivalent of 7 pieces gained per 8 hour day. That's worthwhile, these days.

So far, we've dealt with comparative midgets. Now, in conclusion, regard the Colburn Universal Drilling and Boring Machine shown in Figure 9—a colossus that requires a flat car for its work table. Is it too much of a stretch of imagination to visualize a train of cars, each with its preloaded workpiece or assembly, shuttling under the spindles? For preloading opens ways to increased production that, modern progress regardless, have been but superficially explored.

THE END.

Bell Aircraft Photos

Among other surprising results, Bell engineers discovered that the harder the steel, the easier this converted wood-working saw seemed to cut.

●

Left: **Cutting two half-inch pieces of armor plate at one time.**

Below: **a Tannewitz wood saw.**

Wood-Working Saw Applied to METAL-CUTTING

LAST month, THE TOOL ENGINEER presented an article by Arthur Schwartz, Tool Research Engineer at Bell Aircraft Corporation, describing some of the unconventional metal cutting applications developed by Bell. Space limitations prevented description of an important application of wood-working saws to cutting metals as hard as armor plate and file steel.

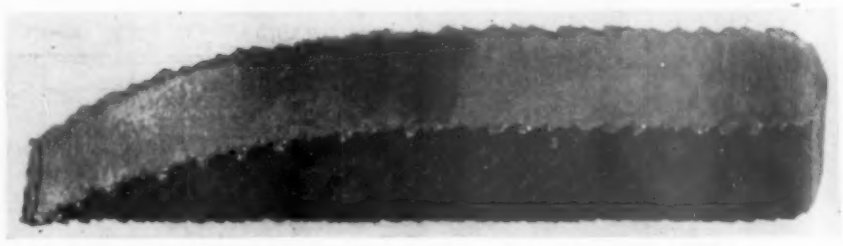
The machine adapted to metal-working was a Tannewitz wood saw, where the blade travels 12,000 feet per minute. Some ordinary carbon steel blades were made. A rather heavy or wide set was used, and a rather soft spring temper. A few experiments determined the best blades, and some surprising results. Not only were ferrous and non-ferrous materials, soft and hard steels, cut, but the harder the steel, the easier was the cut.

Little resistance is encountered. In fact, one of the photos shows the operator holding the part in his hands without resting it on the table. Actually, the metal is burned. The friction of the teeth not only melts the metal, but turns most of it into gas, as can be noticed by the color of the flame under the sawing point. But the speed is so fast that chips, gas and heat are swept away before adjacent metal is affected. This might be considered just a stunt, but Bell has converted about 18 saws for such operations as trimming and making boiler plate dies. THE END.

Above: **cutting a file without drawing the temper.**

●

Below: **part of file cut off, showing the smooth cut.**



Multiple Automatic Drill Ups Production 350%

GERALD ELDRIDGE STEDMAN

A SECOND PHASE of manufacturing enterprise is well upon us—the redesign of tools and fixtures to fit them more effectively to specialized war production. At the N. A. Woodworth plant, producing aircraft parts, a machine tool recently placed in operation has succeeded in upping production from 250 to over 900 pieces per hour, and with other attendant benefits.

It is a multiple automatic, horizontal drilling machine, one of a number of machines redesigned in a production refinement program. The new machine tool is applicable to many productive operations.

The operation involves the drilling of six centered holes, one on each side of a half-inch hexagon neck on the end of a cylinder head bolt, each drill stroke piercing approximately one-eighth of SAE 4640 steel to leave a clean break-through at the bottom of a countersunk cup with an approximate ½ inch O.D. somewhere near ⅜ inch deep. These dimensions are loosely defined because of censorship restrictions. A No. 50 drill is used. A photograph of this part is shown, illustrating the operation. (Figure 1).

The job was originally set up for vertical drilling, the piece being held in a fixture and the operator twirling the piece with left hand as she operated a down lever with her right, making six drill passes as she twirled the blank bolt end from position to position in accommodation of the hexagon sides (Figure 2). The job called for exceptional manual dexterity, muscular coordination and timing if production of any consequence was to be achieved, and women operators were found most proficient.

However, the human element and hand-feed of this vertical drill caused continued trouble in drill breakage, missing holes (in that the operator would often drill five and throw, thinking she had drilled six), and failure to drill through. A considerable scrap was being developed which, considering the cone, heat treat, centerless grinding, broaching, centering operations that precede this drilling operation, caused a considerable processing cost to be thrown away with each piece scrapped for these reasons. Naturally, it was one of the first improvement opportunities uncovered by the Woodworth re-design survey. Top production by this old method was 250 pieces per hour.

- Tool redesign is a significant trend in second phase of mass war production

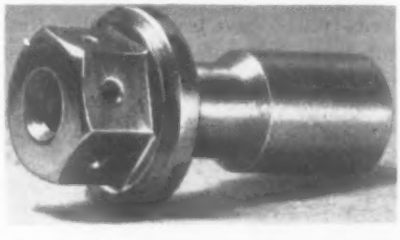
The new design consists of six horizontal drilling fixtures (Figure 3) with six individual motors driving six individual spindles fed from a common cam. This new machine has hydraulic feed, is 100 per cent flexible, and can be set as desired. The top has been uniquely designed to eliminate chips. A big cam plate is mounted in such manner that the spindles are driven by V-belt motors below. The six drills stroke synchronously, the principle being that of three opposite drills being set 1/32 inch in advance of the other three to relieve drill interference at the end of the stroke at the center of the 3/16 inch hole. Thus in the travel, three drill tips are at stroke completion as the opposite three are at the I.D. of the hole.

The parts are fed manually (Figure 4) and with one movement of the clamping lever are drilled to completion, the part is ejected mechanically, the spindles are returned to their starting position. A light provides signal control to the operator. During the drilling process, the light is off, and is on when the part is being fed. This is the reverse of the usual control. The idea is that an on-light during the work cycle would confuse the operator in case of accident for the light would then immediately go off and she would be apt to think the cycle had been discharged. The piece can be fed with impunity with the light on but cannot be tampered with when the light is off, thus eliminating accident hazard.

These drills need close chucking. Each spindle is set on an auxiliary slide that can be moved back as much as 3 inches to install a new drill, or to sharpen. Removal and repair can therefore be freely accomplished quickly without any tear-down. All drills can be brought to their maximum length of penetration and stopped at peak, permitting decimal setting for penetration. The six spindles on the big plate are individually cammed with each opposite triad of drills set away 1/32 inch (Figure 5). They travel at 4500 r.p.m.

The secret of stopping drill breakage has been found to be the perfect alignment of drill and bushing. The center line of the two must not vary .001 inch. If it is off .002 inch, Woodworth experience is that production is limited to 40-50 pieces; a misalignment of .003 inch drops this to 20 pieces, but perfect alignment, inside .001 inch makes it possible to achieve 700 holes. The perfect alignment of the center fixture is very solid.

A natural question is, "What if a drill is broken, will the machine carry on with the stroke of five?" This is



Above:

Figure 1, bolt blank produced on automatic screw machine, with the hexagon head broached to accurate tolerances. Operation involves drilling six centered holes, one on each side of neck.

Figure 2, old and new methods of drilling operation. Special machine on the right drills six holes, completing operation in one cycle. Machine on left is single-spindle drill press with V-block fixture, requiring six cycles of manual operations.

impossible. The broken drill pins the part into the fixture and it will not come out automatically. The top is easily removable and can be quickly taken off, the part relieved, a new drill placed, the fixture reset to go.

This Woodworth automatic, hydraulic fed, horizontal multi-drill actually uses less drills than the older method of hand operation. The operator cannot hurry. The human element is eliminated. The machine tool is in performance 24 hours a day and its net production is 900 pieces per hour with a capacity of 1200 pieces per hour.

Inasmuch as the part is drilled upside down, lubrication is easily achieved within the center hole, where it swishes around, the extra coolant surging overside and lubricating the drills going into their stroke. The coolant from the bottom washes the seat upon which the part sits, giving a clean resting plate at all times. The operator no longer spends time wiping off. The drill is washed going in and cooled coming out of the stroke. The coolant overflow has a geyser action that does a neat job of washing chips away.

Adaptations of this principle are being rigged for other difficult drilling jobs. The saving in man-hours, in drill breakage and in scrap, has been exceptionally significant.

Trend toward redesign

It is this sort of tool redesign by the survey method that opens a second phase production opportunity which should be of great value in reducing costs, with important benefits in the saving of man-hours. It represents another important contribution of management to war effort.

Such war production as aircraft engine parts has introduced new forms, shapes and dimensions with many peculiar machining requirements and in such volume that, ordinarily, they would have been worthy of special machine tool design in the start. But the urgencies of war left no time for that. The prime management policy was to achieve such production as was possible through fast adaptation of conventional processing methods. There were enough beginning worries without concerning themselves with production refinements. This having been achieved, however, the renegotiation of contracts and threatened manpower shortage has spurred management to survey carefully all operations in the hope of improving them, with the aim of conserving costs and man hours.

Much of the impetus has come from workers themselves, whose suggestions are being energetically promoted by all manner of plant incentive programs and are being encouraged further by WPB awards. The Packard Motor Car Company has achieved much from this direction (*"Work To Win,"* THE TOOL ENGINEER, January 1943). It has been fortunate in having old employees of long machine experience who have been capable, after sufficient routinization, to contrive improvements in war tools and fixtures of notable value.

However, there are concerns of such recent origin as to be handicapped by newness of organization, and at times by shortage of experienced operators possessing the journeymen skills to suggest operational improvements, even, in fact, short of sufficient toolmen to do much more than set up jobs. This, naturally, imposes a greater task upon management who, rather than rely solely upon the upsurge of suggestions, carefully surveys possibilities and from the top, sets up methods for improvement to attain production efficiencies of this kind. This necessitates a type of management capable in tool design.

Example of this type of effective management handling of war tool redesign, is the N. A. Woodworth Company, manufacturer of 102 aircraft engine parts, located in the Detroit area, a leading subcontractor to Wright Aeronautical Corporation, whose beginning was in 1939, and whose rapid expansion finds it now at the 5,000 employee mark. It is among the companies turning out the largest production per square foot of factory space devoted to war production. Sixty per cent of its workers are women and better than 80 per cent of its employees had had no previous machine experience. Although worthy suggestions have been made by employees, they have perhaps not been as numerous because of the freshness of the organization and their unfamiliarity with mechanics.

No sooner had the company developed mass production momentum than a tool design survey system was set up. Through a signally successful running analysis, a list of redesign possibilities has been uncovered upon which the Master Mechanics Department has already made significant progress in production refinements, as shown in the detailed example of the multiple drilling machine. THE END.

Figure 4, loading view of special drilling machine. Operator loads with left hand. When clamp is in holding position, feed cycle of drill spindles automatically starts.

On completion of cycle, red light notifies operator; the clamp is released with special action which deposits finished part in chute.

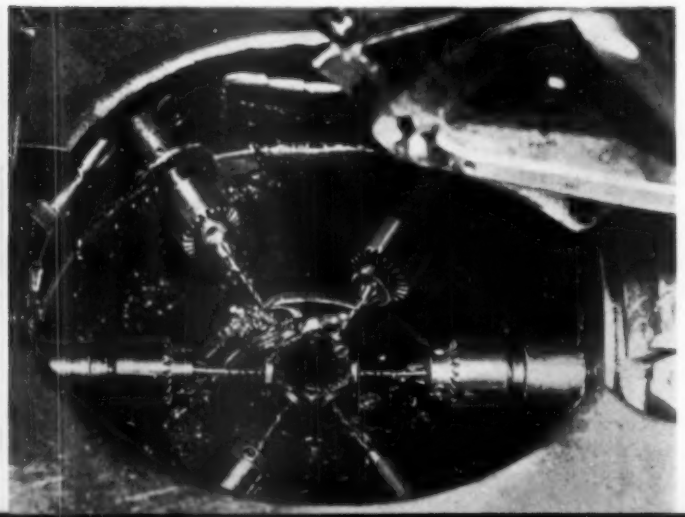
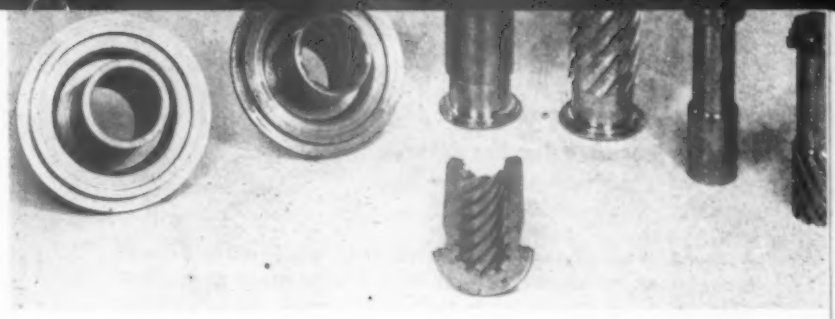


Figure 3, top view with guards removed, showing fixture and six spindles with chucks and drills in working position.

Broach and Hob Spiral Splines

Dual lead angles in engine starter are produced by unusual combination



Above: Figure 3, parts comprising starter sub-assembly shown before and after broaching and hobbing. Center member is sectioned to show splines.

Figure 1, combustion starter assembly.

Right:

Figure 2

Spiral broaching internal splines with high helix angle on a Colonial horizontal machine.

PRODUCTION POSSIBILITIES inherent in combining interlocking broaching and hobbing operations are represented by the combustion starter sub-assembly shown in Figure 1.

The sub-assembly consists of an inner shaft with a spiral spline on one end, a middle member into which the shaft is fitted, and a hub. A spiral spline is also used to fit the hub to the middle member, but the lead angle is the reverse of that on the shaft. When the shaft and outer hub are held against endwise movement and rotation of the hub is also prevented, movement of the middle member in and out of full engagement of the splines causes shaft rotation. Since the load angles between the parts are reversed, the amount of rotation is approximately doubled over that obtained if only one spiral spline is used in conjunction with a straight spline.

Freedom of longitudinal movement of the three mating parts for the entire length of travel demands that specified helix angles of both internal and external splines be accurately maintained. "Tooth" form or contours and spacing of the splines also must be accurately reproduced, while close concentricity between inner and outer splines of the middle member is necessary. Broaching was selected as the only practical method of cutting the female splines to required precision, while the male splines are cut with precision ground hobs.

The broaching operations are performed on Colonial horizontal broaching machines equipped with helical drive attachments and broach guide heads and lead bars to assure both conformance to the desired lead angle and concentricity (See Figure 2). In general, therefore, the setup is similar to that used for broaching the internal splines of automobile transmission gears.

However, the greater length of the splines and the need for maintaining helix angles on three instead of two parts (as in transmissions) increases the precision with which operations must be performed.

Operations detailed

The inner member or shaft is turned from molybdenum steel bar stock and consists of a hollow shaft on which a straight spline is cut on one end for attachment to a clutch. On the opposite end a helical spline with a counterclockwise twist is hobbed. The helix angle in the type shown is approximately 35°, providing a lead equivalent to one revolution of the shaft for about 8 inches of travel. The length of this spline is 1½ inches and overall length of the shaft is 6¼ inches. Limits on the O.D. of the finished spline are plus or minus .0025 inch.

The middle member is produced from centrifugally cast high-tensile Ampco bronze, tough to machine. The internal spline on this member is broached in two passes, using a roughing broach and a shorter finishing broach. Both broaches are guided, providing double assurance of accuracy. At the same time the finishing broach can be made sufficiently long to provide for accurately finishing to specified size. Broach cost is also reduced since wear on the roughing broach does not affect the finishing operation. In turn the amount of wear on the finishing broach is less since the amount of metal it removes is small. Limits on the I.D. of this part are within plus or minus .0015 and on the root diameter of the spline .002 inch. Overall length of the part is 5½ inches.

The outside of the middle member is hobbed to produce 10 splines, having a clockwise helix of the same lead as the inner spline. Since this part is more than 5 inches long and the lead angle is about one turn in 8 inches, approximately 1¼ turns is provided by sliding the inner members out of engagement. Throughout this movement minimum friction must be maintained without excessive looseness. Limits on the outside diameter of the external spline are plus or minus .0025 inch.

The hub is of forged molybdenum steel. Its internal spline which mates with the middle member is broached as illustrated in Figure 2. The method of holding the outer and middle members is simple. Both are placed in recessed cups centered in the face plate and are held by clamping dogs to prevent movement during broaching. Length of the spline is approximately 2⅜ inches. Limits on the I.D. are plus or minus 0.0015 of specified dimensions.

THE END.

Westinghouse Forum pervaded with healthy concern for the future.

A round table discussion on "Hydraulic vs. Electric Drives" brought out the benefits of each over a wide range of applications which considered linear and radial motion, speed of table travel and reversing motion. The experts generally agreed that each drive had its field of superior application, that borderline propositions were individual cases.

Taking part were (left to right), H. N. Seyferth, Ex-Cell-O Corp.; E. Y. Seburg, Barnes Drill Co.; R. A. Cole, Norton Co.; R. Herrstrom, Rockford Machine Tool Co.; B. P. Graves, Brown & Sharpe Mfg. Co.; G. M. Glass, Gisholt Machine Co.; and L. W. Carbett, Heald Machine Co.

Machine Tool Engineers Consider Electrification Problems

THE general temper of the eighth Westinghouse Machine Tool Electrification Forum, April 6 and 7, at Pittsburgh, was well reflected in the talk by James Y. Scott, president of Van Norman Machine Tool Company, at the closing banquet. Mr. Scott indicated to the Forum's 296 members, that he was as interested in the future as anybody. But he was not inflicting himself with worry. He believed that there would be a scramble to develop better means for living. For auto builders concerned with competition from air travel alone, he warned that railroads may furnish a surprise.

How far development on the peace time industrial front will proceed it may be inferred, will depend upon how well machine tool men obsolete present production equipment, providing better means for producing better ways of living. In other words, let's obsolete pre-war conditions and pre-war thinking, all along the line.

This was quite contrary to the mood and outlook of Tell Berna's report on the condition of the machine tool industry. As general manager of the Machine Tool Builders' Association, Mr. Berna said that the diminishing backlog of orders was stimulating machine tool manufacturers to consider production of weapons. But what about peace? Based on pre-war consumption, foreign and domestic, enough machines have been built to last some twenty years. To preserve the skills, one plan has been proposed whereby machines would be returned or resold to the manufacturer who would rebuild them for sale at a price covering his costs and providing some sort of existence profit.

Berna, however, saw only partial salvation in the many suggestions as to where machine tool builders might turn their talents and resources. In the first place, the condition of their resources could not be forecast. To this end, he asked that they be permitted to keep enough profits to tide them over a period in which they might produce improved means for production. Mr. Berna, faced the future with certain facts at hand — the number of tools now in use, the sales and consumption experience of pre-war years.

However, many members of the Forum, queried individually, were not willing to string along entirely with Berna's outlook. Primarily, their feeling was that the pre-war period was invalidated as a sound basis for prognostication. First, they included the lean thirties. Second, these men felt that the war had interrupted some rather startling developments, both here and abroad, which would stimulate production.

The forum was highly interested in the informal talk by G. Edward Pendray, assistant to the president of Westinghouse, who aided in getting the meeting off to a good start by revealing some of the activities in which his company is engaged. Surprised at the amount of activity unveiled, the audience learned that still more was being done about which nothing could be said.

In following sessions, production and design engineers, builders and users of machine tools, heard and saw much to help them in their jobs today, much to stimulate their thinking about post-war trends.

WIDE MOTOR SPEED RANGE FROM A-C SUPPLY

T. R. Lawson, Westinghouse electronic control engineer, presented late results of the search for a motor with exceptionally wide adjustable speed range to operate from alternating current. To date, special adjustable speed alternating current drives for general purposes have all presented some undesirable features, whether it be speed range obtainable, speed torque characteristics, first cost, maintenance or mounting difficulties. One of the latest systems designed to fulfill as many of the desired requirements of an a-c variable speed motor as possible is the electronic Mot-O-Trol. The basic idea is not new, Westinghouse having furnished such motor drives on special applications some years ago. Recent refinements eliminate many earlier handicaps, and according to Lawson, make the new electronic systems comparable or better than existing solutions.

Speeds may be preset to any desired speed within the design range with two speed-control potentiometers and reversing contactors as indicated. Speed also may be adjusted at any time while the motor is running, and

acceleration is stepless. The standard Mot-O-Trol automatically regulates motor speed, if adjusted for any one speed, so as to maintain essentially constant speed regardless of load. The motor is stopped quickly by means of a dynamic braking resister which is not in the motor circuit during running conditions. The amount of braking resistance is adjustable.

CONTROL OF OIL MIST AND SMOKE

A serious problem in certain manufacturing plants concerns large amounts of oil smoke and mist. It is the result of higher operating speed of machine tools, causing part of the coolant oil to be broken into a fine mist, and under some conditions part of the oil to be volatilized; increase in the number of hours per day each machine is operated; and concentration of machines.

E. H. R. Pegg of Westinghouse, considering this problem, stated that it can be overcome to some extent by simple ventilation, but this is expensive because the large amount of outside air required causes excessive heat loss in winter and refrigeration loss in summer. Then, too, in most localities, the outside air is filled with dust and dirt. A solution to the problem is provided by the Precipitron electric air cleaner. The high efficiency of electric air cleaning permits air so cleaned to be recirculated.

One method of applying electric air cleaning to the problem of oil mist and smoke removal is the central air conditioning system. This keeps the concentration of oil mist and smoke so low that no visible haze is present in the room, but the oil mist must still travel through the room, and thus settle or condense on surfaces and fixtures.

The ultimate solution is the elimination of the mist and smoke at their source. This is done through ventilation of the machines themselves by providing hoods and exhaust ducts to pick up the mist and smoke before it can be spread into the room air. In one case, a small unit at one machine collected 4½ gallons of oil in 24 hours. The average, however, is something like 1½ to 2 gallons of oil in 24 hours. With this much oil being dispersed into a room from each of perhaps 50 machines, it is easy to understand why oil is dripping from lighting fixtures.

In many types of machine tools it would be possible to design the machines to incorporate the ventilating system and electric air cleaner within the housing of the machine. This will require close cooperation between the manufacturers of machine tools and the manufacturers of electric air cleaners.

SPECIAL CONTROL CIRCUITS

R. S. Elberty, Jr., consulting engineer with the New Britain-Gridley Machine Division, provided a mathematical analysis of special control circuits. Pointing out that the electrical drive for machine tools is largely control, he reminded the Forum that we no longer just start and stop motors. Our main problem is the selection and grouping of the electrical parts of a machine. Main emphasis was on contacts which establish the condition of the circuits.

There is a close relationship between the functions of a controller and the number of contacts used. A good controller should not have too few or too many contacts, and a control criterion will enable the control designer to make a simple check on his design. Elberty discussed equations which enable the designer to supply proper controls by balancing conditions or requirements against possible combinations of free contacts, first order restraint contracts and high restraint contacts.

TOOLS, INDUCTION HEATING, WPB, ETC.

Other discussions: "Tool Grinding and Its Relation to Motor Selection," by W. J. Pelich and R. H. Clark of the Warner & Swasey Company; consideration of relationship of the War Production Board to the machine tool industry by John Gammel, Chief, Electrical Equipment Branch and John C. Borden, Chief, Electrical Section, Tools Division. Frank W. Curtis, Chief Engineer, Van Norman Machine Tool Company, spoke on the future possibilities of induction heating, covering the facts which were presented in an article by Mr. Curtis in THE TOOL ENGINEER in April. H. A. Frommelt of the Kearney & Trecker Company spoke on "Training Unskilled Machine Operators." A round table made up of industry experts, discussed the pro's and con's of hydraulic and electric drives. THE END.

A talk on motor selection for turret lathes by R. H. Clark of Warner & Swasey, featured this chart on general requirements as related to metals and the type of tooling.

CONDENSED CHART FOR SELECTING MOTORS FOR TURRET LATHES

	Type of Tooling & Recommended Motor Duty			
	STELLITE OR HIGH SPEED STEEL		CARBIDES	
MATERIAL	Drill-Bore-Turn Simple Tooling	Bar Turner or Equivalent Tooling	Drill-Bore Turn Simple Tooling	Bar Turner or Equivalent Tooling
Aluminum, Magnesium and Their Low Tensile Alloys Bronze (Low Tensile)	Std. Duty	Std. Duty	Std. Duty	Hvy. Duty
Aluminum and Bronze High Tensile Alloys	Std. Duty	Std. Duty	Hvy. Duty	Hvy. Duty*
Brass	Std. Duty	Std. Duty	Std. Duty	Std. or Hvy. Duty
Cast Iron Malleable Iron Steel (Free Cutting)	Std. Duty	Std. Duty	Hvy. Duty	Hvy. Duty
Steel Alloys (High Tensile)	Std. Duty	Hvy. Duty	Hvy. Duty	Hvy. Duty*

*High Tensile Alloys may require Extra Heavy Duty Motors because of High Cutting Torque required. AC Motors on full voltage will carry approximately 100 per cent Momentary Overload Without Stalling. See Motor and Drive Data for Information on Extra Heavy Duty Applications.

NOTE: FOR ALL REVERSING SERVICE ON RAM TYPE MACHINES AVERAGING FOUR OR MORE SPINDLE REVERSALS (DIRECTION CHANGES) PER MIN. *USE HEAVY DUTY MOTORS.*

A Rapid Tooling Method

JOSEPH S. PECKER
PRESIDENT
PECKER, SIMPSON & GLADECK, CONSULTANTS

Drill jigs, dies and fixtures can be cold-molded from this new material. Here are details of its use after a year in aircraft production. This material offers many new possibilities.

THE NEED for economical, simple methods of tooling has been urgent. Many innovations have been suggested and tried with success. Formrite is one of the recent contributions toward breaking the tooling bottleneck, having been made available for practical purposes in the spring of 1942 through the development of Mr. Ralph Mancuso of the Art Plastic Company, in cooperation with the Brewster Aeronautical Corporation.

Formrite has served the aviation industry's need for rapid tooling in the manufacture of drill jigs, stretch dies, forming blocks, inspection fixtures, spotting fixtures and trimming templates. One type has been developed primarily for use as mandrels in plywood plane production. Successful application in plane production has merited its consideration for solving some of the tooling problems of other industries.

Not a plastic in the full sense of the word, Formrite is a combination of both organic and inorganic material, mixed with a special "accelerator." It will flow cold and solidify without special baking. However, it may be termed a thermo-setting composition, generating its own heat through chemicals contained in the ingredients. The heat generated is approximately from 200° to 300° F.

Formrite powder and accelerator are mixed and stirred, preferably under vacuum, in a simple, standard paddle mixer, in batches of approximately two cubic feet. It may be poured into the mold at once, or within an hour or two, without affecting its properties. Upon completion of the cast, 24 hours is the maximum time required for complete solidification. When required for heavy duty, such as stretch dies and forming dies under rubber blankets, a longer period such as 48 hours is preferable. The minutest detail of a model, plaster cast or part, irrespective of the intricacy of curves or compound shapes, may be reproduced with perfect fidelity, including a smooth surface finish.

At this time, none of the ingredients are considered critical materials and are readily obtainable. They may be mixed and molded by non-skilled labor. Formrite may also be sprayed and has been experimentally electroplated.

At this time, three types of Formrite are manufactured, known as Formulas M, E and R. Each has been designed for a specific application.

Formula M is used primarily in the manufacture of drill jigs.

Formula E is used for stretch dies, forming blocks, especially forming blocks used with a rubber blanket, inspection fixtures, spotting fixtures, also trimming templates.

Formula R has been developed primarily for use as mandrels in the manufacture of plywood airplanes and parts.

Accompanying tables give major physical properties and characteristics.

ADVANTAGES OF FORMRITE

● Formrite jigs, dies or nestings may be reproduced to the exact shape of a finished part or model. Calculation of special shrinkages or expansion, as well as grinding or fitting are unnecessary.

Tools may be duplicated quickly, and from the same part, insuring interchangeability of parts made by subcontractors, and rapid tooling to meet increased production schedules. Inexpensiveness and ease of manufacture allow production of a "master" or duplicate set to assure continuation of production in case of fire or destruction by enemy action.

Fixtures and dies made with Formrite are comparatively light, and lightening holes will further reduce the weight if desired. Formrite will not spring or distort under reasonable pressure in drilling, nor will it soften under ordinary temperatures generated in drilling jigs or in stretch dies.

Skilled machinists and tool makers may devote their attention to new problems, because unskilled labor can perform a major share of the tasks incorporated in this process. Critical materials may be entirely eliminated or reduced to a negligible minimum, and valuable time may be saved with a considerable saving in cost as well. Critical tool room machines are relieved for other work.

EXAMPLES OF FORMRITE TOOLS

Figures 1, 2 and 3 illustrate airplane

Below: **Figure 1, Formrite drill jig.**
Left: **Figure 2, drill jig for cast handle.**

part dri jigs, and show clearly the simplici of the jig. A tool designer can ap eciate the problems that might b entailed in the manufacturing of similar jigs by standard tool room methods. In the examples shown, most of the drilling is done against the clamps. However, because the drilling is in aluminum and the required pressure relatively light, this has been found to be wholly satisfactory.

Drill jigs, however, may be designed so that the drilling would be against positive nestings and the odd shapes of the part that would normally necessitate expensive and intricate machining of the jig may be cast directly from the sample part.

Figure 4 shows a fixture for tack welding two odd shapes, and Figure 5 illustrates a stretch die.

Figure 6 shows an extremely interesting application. This concerned the manufacture of a pattern for "Kellering" a propeller blade. The pattern was approximately 78" long, 0" wide and varied in height up to approximately 6". It was necessary to cast this pattern on to a steel plate. Bolts rising from the steel plate were to be imbedded in the cast pattern.

Important factors in connection with making this pattern were:

Fidelity of reproducing the contour.

Expansion under varying temperatures.

Deflection in the pattern.

Figure 3: simplicity a major factor.

FORMRITE: Physical Properties and Characteristics*

FORMULAE DESIGNATED AS:	M	E(9)	R(23)
1. Specific Gravity	1.63	1.73	2.15
2. Weight per cubic foot in pounds (after hardening)	102 lbs	108 lbs	72 lbs
3. Water Absorption (Boiling Water, 24 Hrs.)	2.9%	1.9%	4.1%
4. Visible Effect of 24-hr. water immersion	None	Npne	None
5. Oil Absorption (Kerosene, 24 hrs.)	4.7%	2.3%	5.7%
6. Visible Effect of 24-hr. immersion in kerosene and various cutting compounds	None	None	None
7. Compressive strength per square inch: in pounds at 70° F.	8117 lbs	8943 lbs	4219 lbs
in pounds at 350° F.	7582 lbs	8362 lbs	3642 lbs
8. Tensile strength per square inch, at 70° F.	482	760	248
at 350° F.		Not available	
9. Modulus of Rupture after 20 1-hr cycles in live steam in autoclave at 100 lb. pressure: at 70° F.	975	1545	440
at 337° F.	2387	2675	1279
	3900	5460	310
10. Machining Qualities—(short brittle shavings)	Like cast iron		Like brass
11. Effect of Weak and Strong Acids and Alkalis	Slight to marked, depending on acids		
12. Effect of Common solvents	None	None	None
13. Electrical Conductivity	Little or none, except when moist.		
THERMAL CHANGE			
14. Freezing for 24 hrs. at 25° below 0° F. after soaking in water 24 hrs.	No visible effects		
15. Linear change per foot of length: When heated to maximum point:	+.012"	+.011"	+.002"
Temperature at which expansion ceases	248°F.	253°F.	180°F.
16. Linear change per foot of length at 337° F. wet heat after 100 cycles in live steam at 100 lb pressure in autoclave	+.005"	+.022"	—.038"
17. Linear change per foot of length at 337°F. dry heat in free air	+.025"	+.001"	—.070"
18. Stapling adaptability (for plywood)	Too hard	Too hard	Excellent
Stapling adaptability after 100 cycles in live steam in autoclave at 100 lb pressure	———	———	Satisfactory
19. Penetration ½" Round Rod at 500 lb pressure applied for 15 min.	.002	.001	.013
20. Brinell B	200	225	45

*Characteristics are based on careful laboratory tests in accordance with standard American Society of Testing Material procedure, under the personal direction of Mr. Malcolm Schweiker, President of the American Encaustic Tiling Company. Issued as of January 20, 1943, these physical properties and characteristics are subject to revision and change of formulas.

When cast and allowed to set, it was found that the pattern did not vary from the original wooden pattern by more than a few thousandths. Furthermore, to determine the practicability of shaping such a pattern where varying temperatures in shaping might cause the Formrite to crack, especially since it was bolted fast to a solid steel plating, it was placed outdoors for 36 hours, where temperature varied to a minimum of 20° F. When checked with feeler gages, the panel was found to have no warpage

Below and Right:

Figure 4: Formrite fixture for tack welding —front and back views.

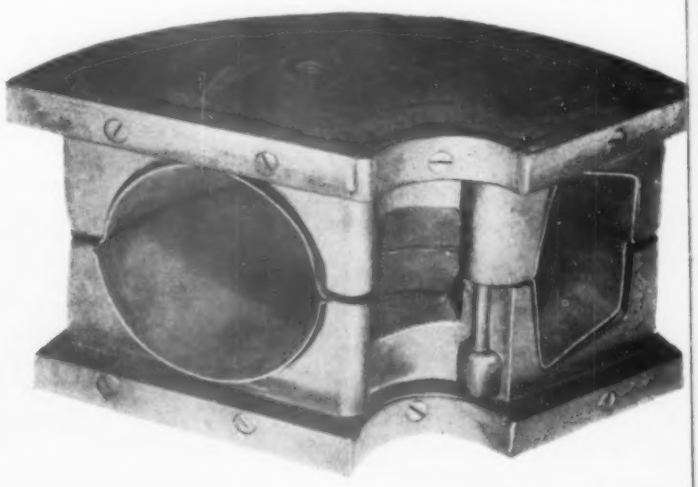


Figure 5: stretch press die and mold.

or separation from the steel bed plate.

No other variation in contour was discernible. The Formrite pattern as bolted to the steel plate was then brought inside and subjected to a temperature of 150° F. for eight hours. At the conclusion of this test, it again showed no discernible changes in shape or separation from the steel bed plate.

Upon conclusion of the test, the bolts were removed so that inspection could be made to determine whether expansion or contraction had occurred around the bolts, or whether cracks or distortion of the bolts were possible. Again no observable change.

Similar patterns may be cast with reinforcement bars, although this is not necessary. The pattern such as illustrated in Figure 6 has no deflection under a reasonable pressure.

PLYWOOD MANDRELS

Formula R, primarily intended for plywood mandrels, has been developed to allow for stapling. Tests show that it requires the same pull to remove staples from Formrite as from a dry oak plank. Formrite will take as many and more staples than wood until resurfacing is necessary. It can be periodically renovated by applying a composition which restores the surface of the mandrel.

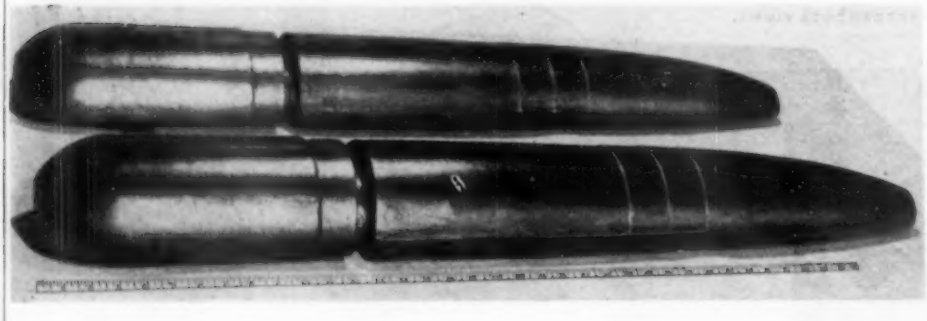
Autoclave tests on the mandrel of Formula R show that after 100 cycles of steam pressure at 100 psi, or the equivalent of 337° F., the surface still holds staples which required 3½ pounds to be pulled out. No cracks, swelling or laminations appear whether the mandrel is used inside a bag or open to steam action.

Compared to wood, Formrite may be considered non-shrinking, water resistant, oil resistant and heat resistant. If exposed to -25° F., for 24 hours, it will not show cracks, laminations or swelling, although the strength will be slightly reduced. This indicates its effective use for mandrels under conditions of continuous temperature change.

It resists change in dimension because of atmospheric conditions and will withstand intermittent temperature changes up to 300° F. Most resinous glues used in the plywood industry will not adhere to a Formrite mandrel, even though it has been cooked in an autoclave.

Once a plaster mold is made, mandrels may be duplicated quickly. As Formrite will conduct heat, it will assist in bonding the plies by bringing heat to the inside surface of the plywood structure.

Figure 7: a mandrel for plywood fabrication.



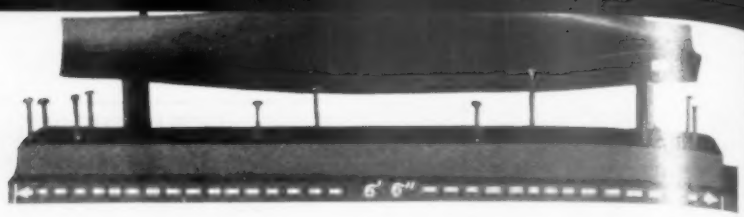


Figure 6: a pattern for "Ke ring" a propeller blade.

TOOL MANUFACTURE

Most drill jigs and other fixtures have been made from selected and approved parts, samples, models or patterns. In many instances, plaster casts are made of odd-shaped sections, and blocks and dies reproduced from these plaster casts.

The most intricate of drill jigs can be manufactured from a sample part in an average of a few days, providing the proper drill bushings are readily available. Few tools, to date, have been made directly from a part drawing. Obviously, with a cast process requiring no machining, it is more expedient and practical to make models of the shapes to be reproduced.

An attempt has been made — and successfully — to standardize the manufacture of drill jigs. In fact, drill jigs manufactured now are produced almost on a production line principle. A large, intricate stretch die or forming die may be made within a few days if proper plaster cast or model is available.

Reinforcements in most cases are unnecessary. However, reinforcements may be used in casting large stretch dies, forming dies or other tools. The type of reinforcements and manner of application is a technique which has been carefully developed. Sharp edges on forming dies, where special depressions are necessary, may be reinforced with steel inserts.

Because Formrite conducts heat, it has been utilized for forming dies for certain plastics and for dies in the casting of phenolic parts.

COST

In the airplane industry, hundreds of odd-shaped parts require drill jigs which may be manufactured at one-half the cost of steel jigs, and require about one-quarter the designing time. Use of unskilled labor is an important factor. Referring to two illustrations, the cost of the drill jig manufactured from Formrite, shown in Figure 1, was $86 for manufacturing, $12 for designing. The jig shown in Figure 2 cost $50 for manufacturing, $6 for designing. THE END.

PRODUCTION DATA SHEET

BROACHES AND THEIR CARE

JOHN A. MARKSTRUM CHIEF ENGINEER
CONTINENTAL TOOL WORKS DIVISION
EX-CELL-O CORPORATION

THE BROACH is one cutting tool that should have the best of care if the utmost in production and accuracy and the greatest economy is to be obtained. A broach is more sensitive to dullness than most cutting tools; especially hole broaches, for these cannot be salvaged to any great extent without losing size.

At times a round broach may dull slightly more on one side, either through handling or through encountering hard spots in the work. This may cause a broach to drift to such an extent that one side of the hole may be entirely untouched . . . a portion of the original hole will be visible either for the full length or at one end, depending on the extent of the uneven dullness. Stock that is hard to machine accentuates this condition, especially if there is any sign of work hardening before broaching.

Sharpening the broach properly usually overcomes excessive drift, although cases have been known in which broaches of varying design and made by different manufacturers to overcome this condition, failed to do so. In one case, a dozen parts could be broached after each sharpening before drift occurred, and this number was virtually the same for all different broach designs. However, a similar forging of the same physical properties, of slightly different size, worked successfully, apparently under the same conditions. The difficulty was overcome by attaining extreme hardness in the broach.

Care should be used in sharpening a broach that is working well to maintain the original hook and fillet (see Figures A and B). If the fillet is made too small, or if the tooth is deepened as shown in Figure A, the chips will clog. The result may be either tearing of the work or tool breakage.

A broach that is carefully watched and properly sharpened when slight worn lands appear on the back of the cutting edge, should give the equivalent number of parts per sharpening as the first grind. Therefore, the less dullness, the greater number of grinds. More grinds give more pieces per broach, higher accuracy and better finish in the product, with less power consumed. It is economy to have more than one broach on hand so that it will be unnecessary to have the machine down for broach sharpening.

Chip-breaker marks sometimes wear into the tooth immediately behind the one containing the chip-breaker. This is usually a sign of running too long between sharpenings. When continued, it may necessitate scrapping a hole broach long before its normal life has been used. On the other hand, under similar conditions, keyway and plain surface broaches may be salvaged.

Round broaches are sharpened on centers and in order to attain sufficient hook, the wheel should be presented at a greater angle than the hook angle, as shown in Figure C, otherwise the edge of the wheel will interfere and leave little or no hook. A small wheel will give more hook than a large wheel.

Keyway and surface broaches are best sharpened on grinders built expressly for this purpose, with the broach mounted either on a magnetic chuck or a suitable fixture. A surface grinder does not have sufficient throat room to care for a long broach. Some broaches, of course, can be sharpened in a cutter grinder.

Convex inserts are held in special arbors and ground on centers, while concave inserts are mounted in fixture and ground in a hole grinder.

A broach designed for cutting one material is not so well suited for cutting another without re-grinding the hook angle and clearance angles. The accompanying table indicates general practice in this regard, to be varied, naturally, as required by any specific conditions.

	Hook Angle	Clearance Angle
Steel	10°—15°	½°— 2°
Cast Iron	4°— 8°	2°— 5°
Bronze and Brass	0°— 5°	¼°—½°

If the broach has been correctly designed, properly made, and adequately maintained, and still results are unsatisfactory, the workpiece should be checked for machinability. As a matter of fact, a fair number of tool failures can be traced directly to improperly conditioned stock in the workpiece.

The cutting compound for broaching serves two purposes: cooling the work and broach, and acting as a lubricant. It is therefore necessary to determine which of these two factors is the more essential and a suitable coolant selected.

Generally, the thinner the compound the more cooling effect it has, and, conversely, the thicker the compound, the more lubricating is its nature. Soluble oil is used in many applications for steel, bronze, brass and aluminum. For heavier work in steel, a sulphur base oil is used. Cast iron is broached either dry or with kerosene or light sulphur oil. For burnishing steel, a heavy special oil should be used to prevent loading of the burnishers. Lighter compounds are used in burnishing brass, bronze and aluminum.

Broaches and parts should be flooded liberally with coolant to carry away heat and chips in addition to insuring proper lubrication.

When storing broaches, they should be coated with a non-rust oil and individually wrapped to prevent rust and nicking.

FIGURE A

FIGURE B

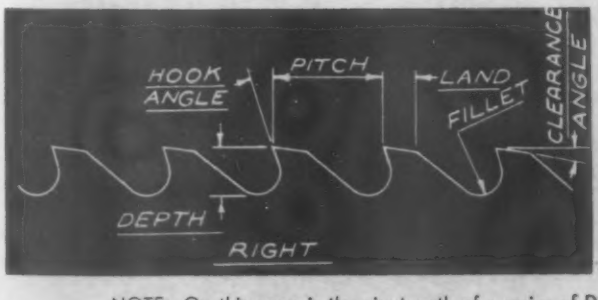
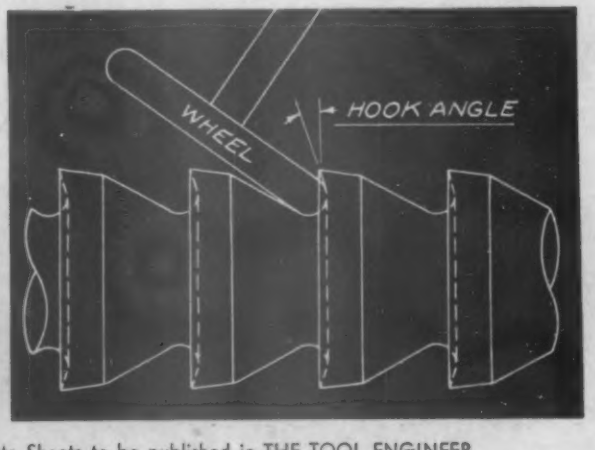


FIGURE C



NOTE: On this page is the nineteenth of a series of Data Sheets to be published in THE TOOL ENGINEER. A handy three ring binder can be secured at any dime store to hold the sheets for quick reference.

The CRIB*

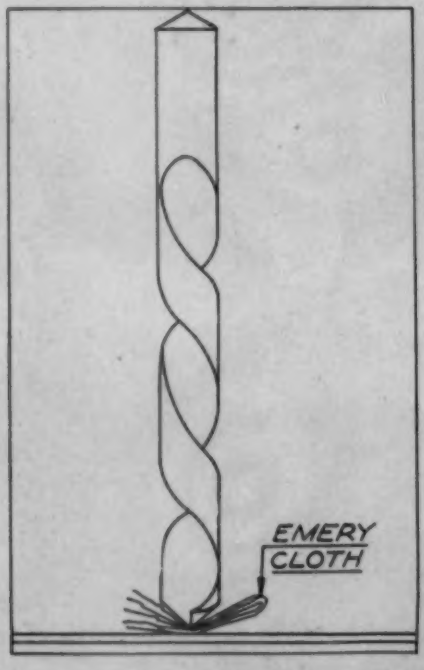
IDEAS • KINKS • SHORT CUTS

*T.M. REG. U.S. PAT. OFF.

Drilling Thin Sheet Metal

WHEN drilling thin sheet metal with a twist drill, it is almost impossible to produce a round hole, because the drill tends to chatter and draw into the metal. The usual procedure, in correcting this tendency, is to grind the rake off the cutting edges, which prevents digging in, but does not eliminate the chatter.

The sketch illustrates a method which does not require any special grinding of the drill, and produces a perfectly round hole.



The revolving drill is pressed into the metal sufficiently only to "spot" the metal half way through. A piece of fine emery cloth is then folded twice, so as to produce four thicknesses. The drill rotation is stopped and the emery cloth is placed under the point into the spot in the metal. As the drill is rotated at normal speed, it cuts through the emery cloth which binds tightly on the drill, thus preventing chatter, and producing a perfectly round hole.

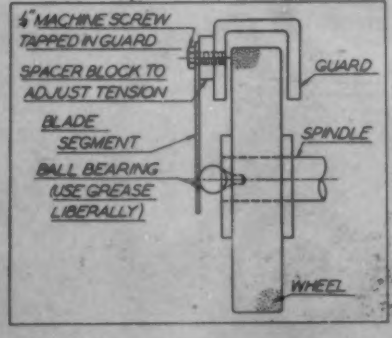
To Speed Drill Jig Operation

WHEN drill jigs have many holes, not readily identifiable with the proper tool, a saving in set-up time can be effected by a simple expedient. Ring the bushings, on the plate surface, or place dots of different colors on the plate adjacent to the bushings. Corresponding to the colors on the bushings, bands of color should be painted on the shank of the respective drills. Bright, readily identifiable colors should be used. Naturally, care must be taken to keep paint from dripping or running into the bushings.

Every good production engineer has devised shop shortcuts, or added to his plant's 'know-how.' Send ideas to THE TOOL ENGINEER for publication for pay.

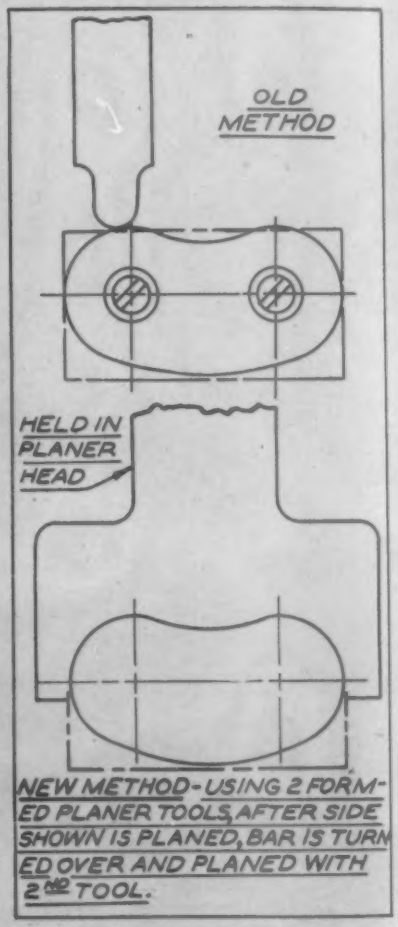
Remove Side Play from Grinder Spindle

TO REMOVE side play from the spindle of a surface grinder, when grinding slots, the following simple set-up may prove practicable. A segment of an old hacksaw blade, about 6 inches long, is used as a flat spring. The spring is placed in contact with a steel ball — an old ball bearing — which is placed in the center of the spindle. As shown in the drawing, the blade is fastened to the guard, and a spacer block used to adjust tension of the blade.

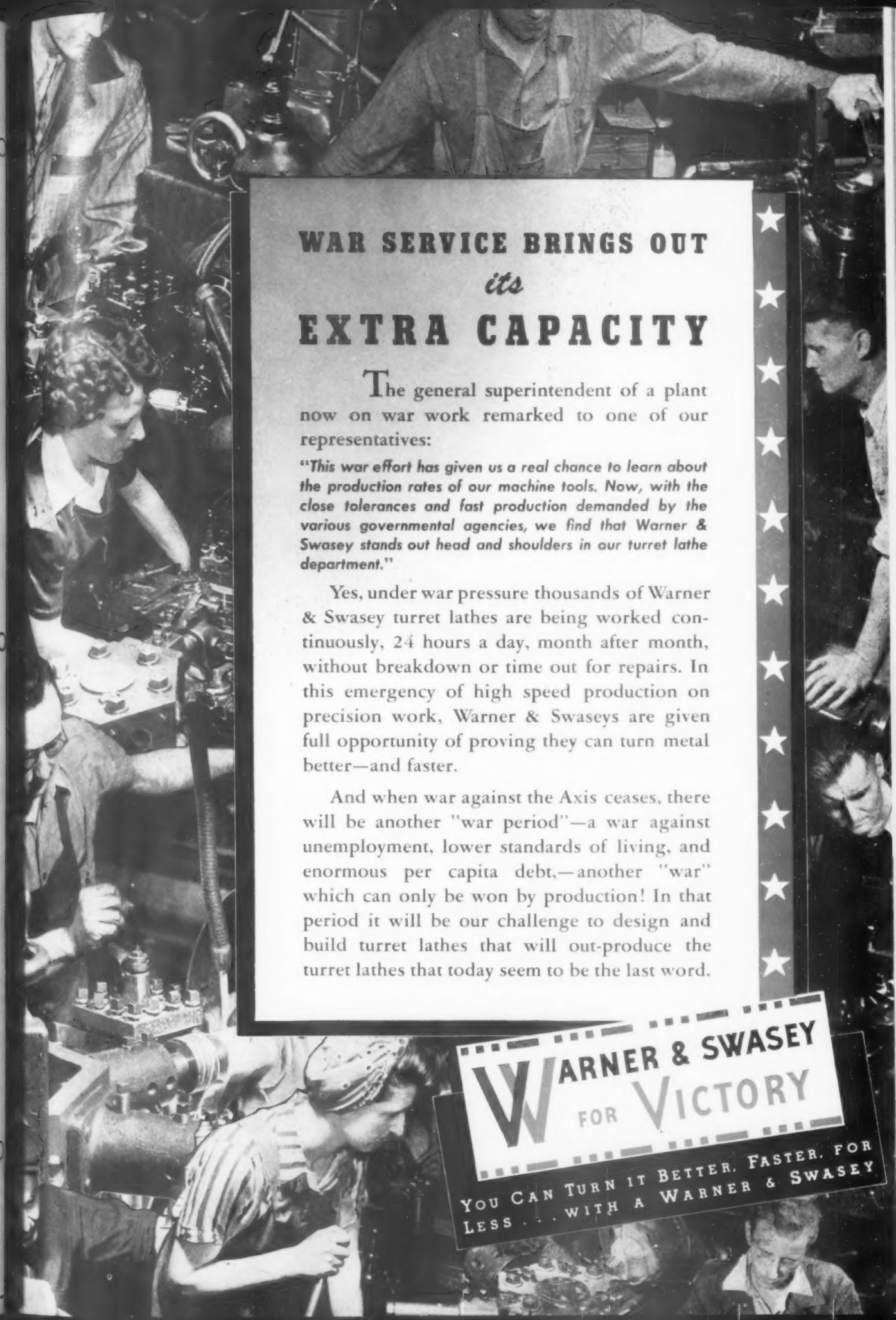


Formed Planer Tools Up Production 500%

EXTRACTOR pocket plugs were formerly made in bar form, planed to shape with round nosed tools, using templets fastened to the end of the bar. Two formed planer tools are now used in line with a suggestion for improving war production submitted by Michael J. Connors of American Type Founders, Inc.



As is shown in the drawing, separate shaped tools are required, one for each side of a 5-foot bar. One bar can now be finished in 2¼ hours. Production gain is 500 per cent. Man hours saved—3 per day. Number of machines released for other production—2 per day.



WAR SERVICE BRINGS OUT *its* EXTRA CAPACITY

The general superintendent of a plant now on war work remarked to one of our representatives:

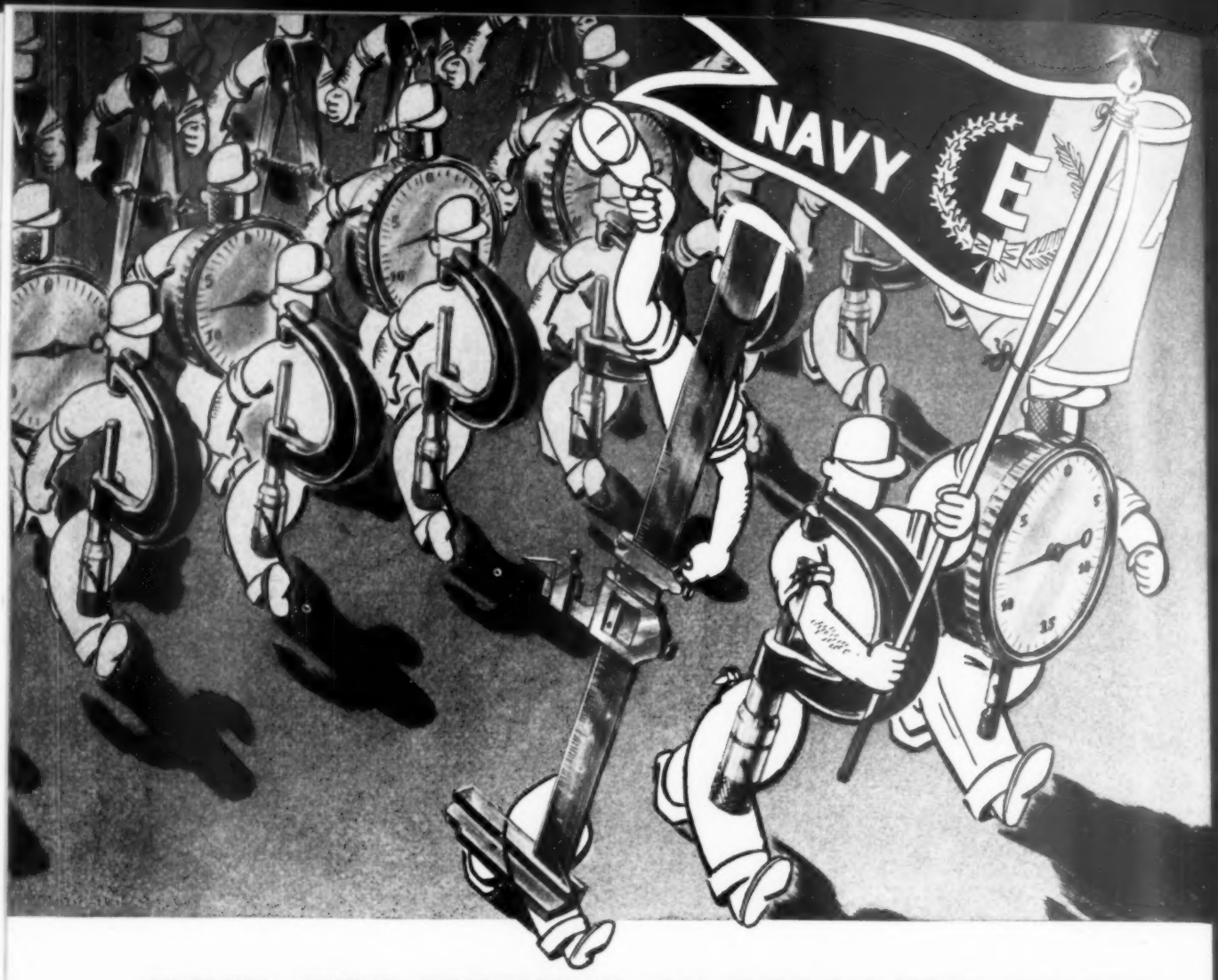
"This war effort has given us a real chance to learn about the production rates of our machine tools. Now, with the close tolerances and fast production demanded by the various governmental agencies, we find that Warner & Swasey stands out head and shoulders in our turret lathe department."

Yes, under war pressure thousands of Warner & Swasey turret lathes are being worked continuously, 24 hours a day, month after month, without breakdown or time out for repairs. In this emergency of high speed production on precision work, Warner & Swaseys are given full opportunity of proving they can turn metal better—and faster.

And when war against the Axis ceases, there will be another "war period"—a war against unemployment, lower standards of living, and enormous per capita debt,—another "war" which can only be won by production! In that period it will be our challenge to design and build turret lathes that will out-produce the turret lathes that today seem to be the last word.

WARNER & SWASEY FOR VICTORY

YOU CAN TURN IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY



NOW, THE MAKERS OF STARRETT TOOLS GET THEIR "E" BADGES

It is fitting that the craftsmen and women who have contributed their utmost skill and energy to the fashioning of unprecedented numbers of precision tools — who kept faithfully and constantly at their vital task from the moment the first bomb was dropped on Poland — now wear this badge of honor, evidencing *"outstanding achievement in producing war equipment."*

Grateful acknowledgment is also due our suppliers and the distributors of Starrett Tools for having done so much to help us attain this honor.

STARRETT TOOLS are lending accuracy and speed and confidence to hundreds of thousands of willing and devoted hands helping to win this war of precision machines and equipment. It is safe to say that virtually every winner of the "E" award has depended directly or indirectly upon the use of Starrett Tools.

The wearing of the "E" badge constantly reminds each and every one of us to keep on doing our level best to produce an adequate supply of the tools worthy of this great responsibility.

THE L. S. STARRETT CO. · ATHOL · MASSACHUSETTS · U.S.A.

World's Greatest Toolmakers

STARRETT

PRECISION TOOLS • DIAL INDICATORS • GROUND FLAT STOCK

HACKSAWS • METAL CUTTING BANDSAWS • STEEL TAPES

Men, Materials and Machines

A New Technique in Wartime Belting

RANDOLPH W. MALLICK

HEADQUARTERS MANUFACTURING ENGINEERING STAFF
WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY

• Rather than replace old belt-driven machine tools forced into service for war production, Westinghouse has attempted to get the most out of these machines by improving existing drives as much as possible.

A method of splicing solid woven cotton belting perfected by the company's engineers for these machines was revealed recently by Westinghouse.

The process provides a satisfactory flat belt drive using no critical materials, and increases production through less slippage and less machine down time due to broken belts. In addition, it is said to be less costly than other belting.

ALTHOUGH texts and reference books have been published from time to time on flat belting applications, the predominance in recent years of other types of belting and of direct and geared drives in the case of power transmission has to some extent forced flat belting engineering into the background.

War conditions necessitate many changes, however, and this has been the case with belting. War production demands have forced into service many old machine tools that have belt drives.

It is obvious that the production value of such a machine tool can be no better than the small, almost insignificant piece of material that serves as the connecting link between the machine and the power source.

At Westinghouse it was recognized at the beginning of hostilities that it would be impossible, even unpatriotic, to replace certain usable equipment because of drives which might not be the last word. We preferred to get the most out of these machines by improving their existing drives to the best possible extent.

Out-performs other types

Several years ago, Max Kholos, one of our beltmen, began experimenting with the splicing of solid woven cotton belting. He knew that there were certain advantages in the use of woven belts for high speed drives, but splicing this material posed difficult problems. Belts of this material had to be endless woven or sewed, and this caused their application to be limited.

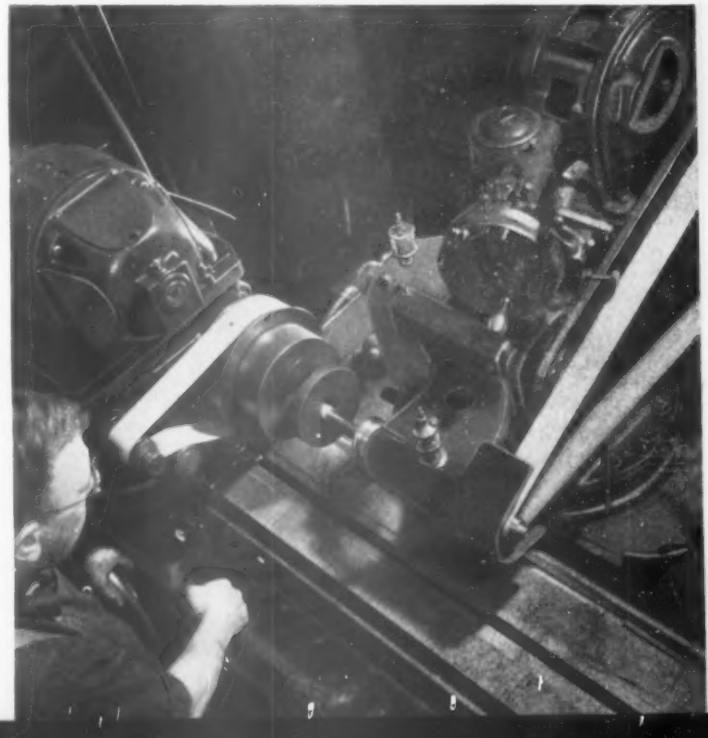
After repeated failures, he finally succeeded in cementing a woven belt which withstood running tests. He submitted his findings as a suggestion, to the Company's Suggestion Committee. He also requested that his findings be carried on by the company's engineering staff.

Investigations proved that his early work offered possibilities, and thorough studies and tests were made on various types of cotton yarns, weaving methods, cementing techniques, belt dressings and applications.

As a result of this work, Kholos was granted a patent on his process and Westinghouse has found an answer to the problem of a satisfactory flat belt drive. The method consumes no critical materials, increases production through less slippage and less machine down time due to broken belts, saves the time of maintenance men and production operators, and is less costly than other belting.

Test records show that woven cotton belting applied by this method has out-performed other types of belting and has in certain applications out-lasted some from two to 10 times.

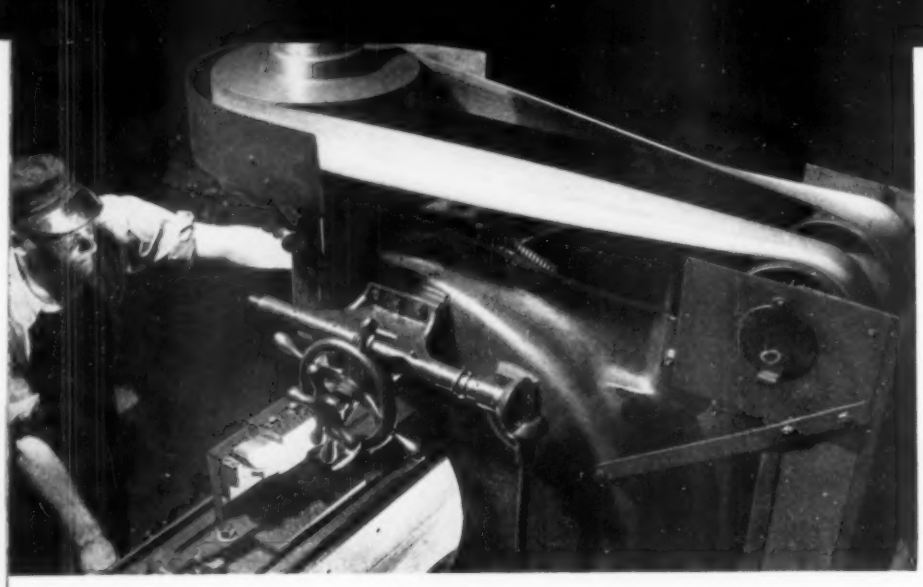
Westinghouse engineers do not wish to convey the impression that solid woven cotton belting is a cure-all for every flat belt application. We



The spindle on a grinder equipped by Westinghouse with spliced belting runs at 18,000 R. P. M.

Endless woven belts cost 10 times that of cemented belts which can be made to exact measured requirements.

Westinghouse Photos



A four-inch wide, five ply belt has been applied to a relatively old profiler at Westinghouse. It is giving newer models good competition.

have, however, proven conclusively that we are getting the best results from its use on most applications, under present day conditions as compared with commonly available materials which can be used for similar machine tool applications.

Typical application

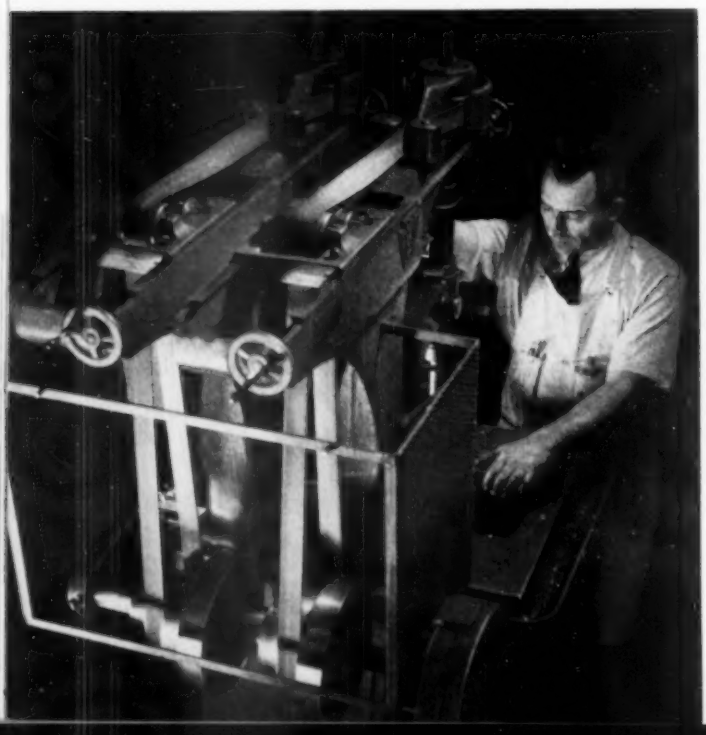
Among the machines on which Westinghouse is using woven cotton belting is the common garden variety of sensitive drill press, such as you find in nearly every industrial plant. Thousands of these machines are in use today, since their normal span of life is quite long. It is not an easy belt task, since the plane in which the belt travels changes several times in each revolution. Belt casualties are often high.

The belts used are 1.75-inches wide, four ply, and when the accompanying photo was taken, they had been in use for three years and one month. They are several of the original test belts.

The machine is located in a tool making department and is used intermittently for 16 hours daily, drilling tool steels as well as mild steels and cast iron.

Another machine equipped with this belting is a six-spindle drill press on production work. The machine is used for continuous, round-the-clock production. Belt life has increased about three times, and operators assert that they have experienced less belt slippage and less drill breakage, and have been able to increase their output and earnings. The belts used are two-inches wide, five ply belts.

A four-inch wide, five ply belt has been applied to a relatively old profiler. The machine is in service two shifts a day on production work, and is giving good competition to some of its younger brothers.



Among the machines this concern has equipped with woven cotton belting is the common garden variety of sensitive drill press.

The belts used are 1.75-inches wide, four ply, and have been in use for more than three years drilling tool steels as well as mild steels and cast iron.

The spindle on a grinder equipped with spliced belting runs at 18,000 R.P.M. The belts are two ply, one being two-inches wide, and the other 2.5-inches wide. Endless woven belts cost ten times the cost of these cemented belts which can be made to the exact measured requirements, and can be shortened and respliced if they should stretch. This example is illustrated in an accompanying photo.

One of the most difficult belt applications is on screw machines. This is due to quick saturation with the cutting oils used on the machines. The performance of solid woven cotton applied by the Kholos process has been amazing. Despite complete saturation with oil, slippage has been almost negligible. Belt life increased about 500 per cent.

The silencers on the feed magazines on a battery of these machines at Westinghouse are also made of solid woven cotton belting.

The quality of finish obtained on a surface grinder was improved when cotton belting was applied. The belt used is 1.5-inches wide, three ply, and the wheel speed is 3,200 R.P.M. Used 24 hours daily, seven days a week, the belt averages two months of life.

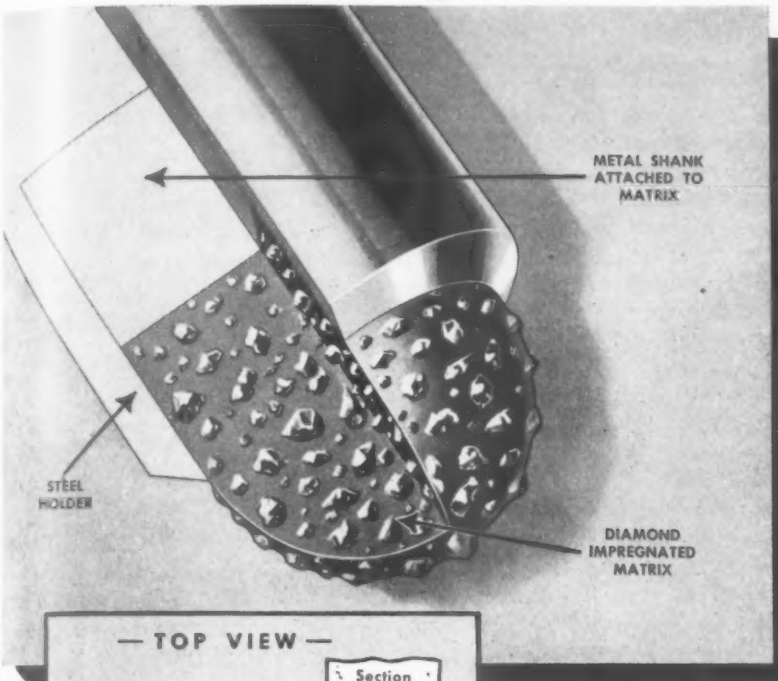
Used on conveyors

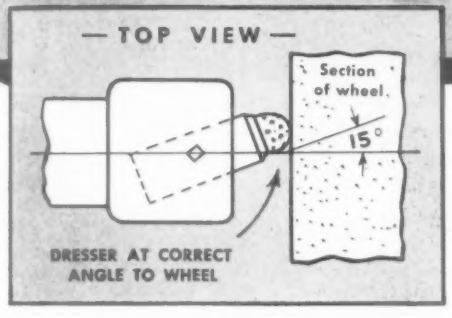
We have tried heavy duty applications. A good example is an air compressor, driven by a 100 horsepower motor. The belt is 16-inches wide, eight ply. It was used for 18 months in one plant and when the compressor was dismantled and moved to another plant, the belt splice was opened, then respliced when the compressor was reinstalled. It now has about two years of running to its record.

Applications of belting other than machine drives, have also been investigated. A conveyor in one of our metal stamping departments is several hundred feet long and carries considerable load. Canvas belts with metal clips were used previously. The stitched plies of the canvas belt separated, also the metal clips pulled out due to the loads on the belt. A solid woven, cemented splice belt has been running several years.

We have thus far discussed the advantages and looked at the applica-

Here is the most *"fool-proof", "abuse-proof"* way to use diamonds for dressing grinding wheels





Easy to Use

Simply place the dresser in a holder, on a 10° to 15° angle and put holder in your standard adaptor. Give dresser a ¼ turn in holder daily and a new cutting surface is presented to wheel. No remountings necessary!

You'll have no worries about *single, large, expensive* diamonds when you use the Diamond-Impregnated Carbide (D.I.C.) dresser. Contains a multiplicity of sharp diamond particles firmly embedded in a cemented carbide matrix moulded to shape of each diamond. They can't come loose—can't drop out! Every diamond stays on the job until the last carat of usefulness is consumed. "D.I.C." dressers save you money and time all along the line. No remountings required—just a ¼ turn of dresser in holder presents a new cutting surface. No switching to smaller jobs as the dresser wears. You can use it throughout its life on the same job if necessary. No moving parts to repair or replace. Uniform price.

Save at least 25% annually on dresser costs. Write for folder DR-100.

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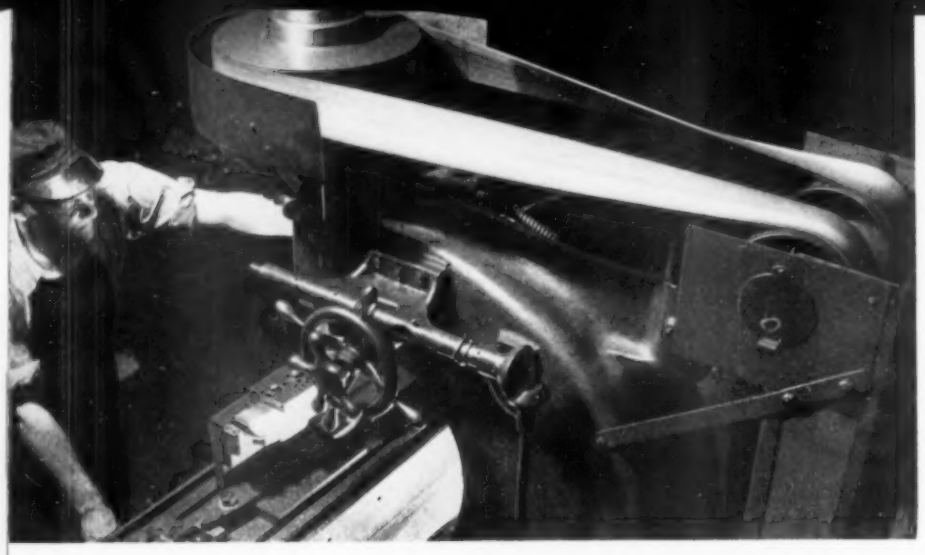
Another USE FOR CARBIDES

CARBOLOY TRADE MARK CEMENTED CARBIDE DIAMOND IMPREGNATED DRESSERS

For GENERAL USE ON GRINDING WHEELS



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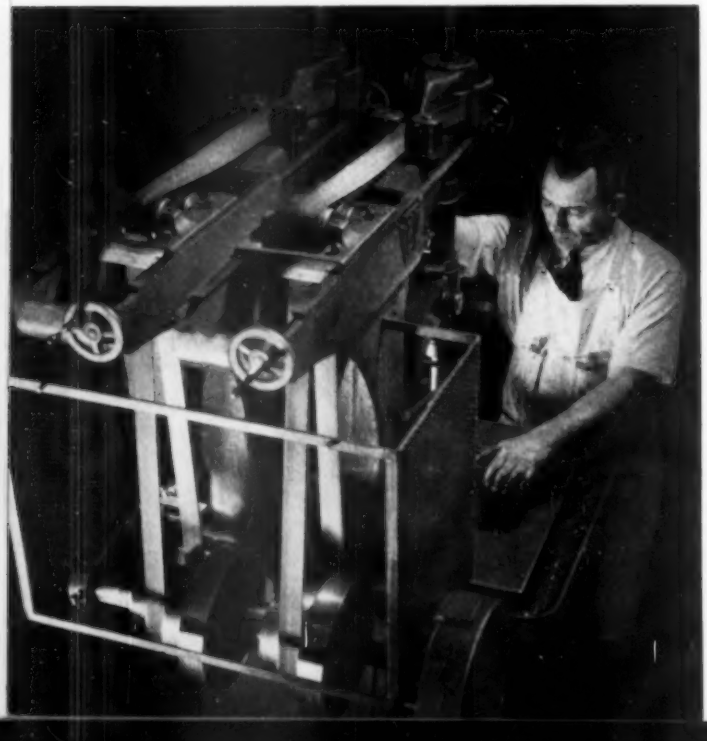

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One of the most difficult belt applications is on screw machines. This is due to quick saturation with the cutting oils used on the machines. The performance of solid woven cotton applied by the Kholos process has been amazing. Despite complete saturation with oil, slippage has been almost negligible. Belt life increased about 500 per cent.

The silencers on the feed magazines on a battery of these machines at Westinghouse are also made of solid woven cotton belting.

The quality of finish obtained on a surface grinder was improved when cotton belting was applied. The belt used is 1.5-inches wide, three ply, and the wheel speed is 3,200 R.P.M. Used 24 hours daily, seven days a week, the belt averages two months of life.

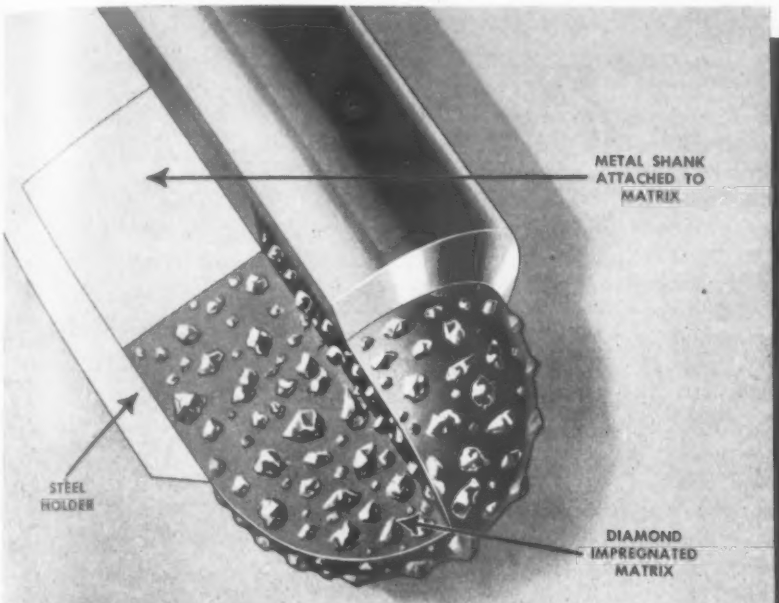
Used on conveyors

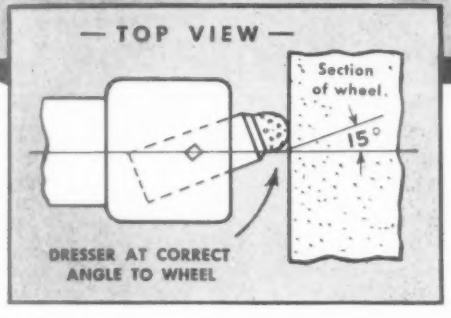
We have tried heavy duty applications. A good example is an air compressor, driven by a 100 horsepower motor. The belt is 16-inches wide, eight ply. It was used for 18 months in one plant and when the compressor was dismantled and moved to another plant, the belt splice was opened, then respliced when the compressor was reinstalled. It now has about two years of running to its record.

Applications of belting other than machine drives, have also been investigated. A conveyor in one of our metal stamping departments is several hundred feet long and carries considerable load. Canvas belts with metal clips were used previously. The stitched plies of the canvas belt separated, also the metal clips pulled out due to the loads on the belt. A solid woven, cemented splice belt has been running several years.

We have thus far discussed the advantages and looked at the applica-

Here is the most *"fool-proof", "abuse-proof"* way to use diamonds for dressing grinding wheels





Easy to Use

Simply place the dresser in a holder, on a 10° to 15° angle and put holder in your standard adaptor. Give dresser a ¼ turn in holder daily and a new cutting surface is presented to wheel. No remountings necessary!

You'll have no worries about *single, large, expensive* diamonds when you use the Diamond-Impregnated Carbide (D.I.C.) dresser. Contains a multiplicity of sharp diamond particles firmly embedded in a cemented carbide matrix moulded to shape of each diamond. They can't come loose—can't drop out! Every diamond stays on the job until the last carat of usefulness is consumed. "D.I.C." dressers save you money and time all along the line. No remountings required—just a ¼ turn of dresser in holder presents a new cutting surface. No switching to smaller jobs as the dresser wears. You can use it throughout its life on the same job if necessary. No moving parts to repair or replace. Uniform price.

Save at least 25% annually on dresser costs. Write for folder DR-100.

CARBOLOY COMPANY, INC.

Sole makers of the Carboloy brand of cemented carbides

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Another USE FOR CARBIDES

CARBOLOY CEMENTED CARBIDE DIAMOND IMPREGNATED DRESSERS

For GENERAL USE ON GRINDING WHEELS

tions of woven cotton belting. Now a few words on the materials and the process itself.

Like so many valuable developments, the final method is quite simple. No expensive equipment or special tools are necessary. The splice can be made right at the machine which is an added advantage. This permits the use of cemented belting having all the advantages of endless belts on machinery and equipment which is so constructed that endless belts cannot be used.

For power transmission

The belting can be made in widths ranging from .375-inches to 84-inches. Thickness varies from two to eight plies. Any length can be made. When setting up looms the mills require a minimum length of 500 feet for a given size, as setups for smaller quantities are uneconomical. Popular sizes are stocked by the distributors and orders for smaller quantities can usually be filled from stock.

For power transmission purposes, a specially woven belt is used. This belt is woven to Westinghouse Specifications and embraces what is known as an "inner bound" weave. This type of weave permits greater flexibility, also prevents the plies from separating should some of the surface threads become worn or broken.

This new belting technique has been applied to other than machine tool jobs. Here is a cemented spliced conveyor belt, several hundred feet long, which has been in use for more than two years.

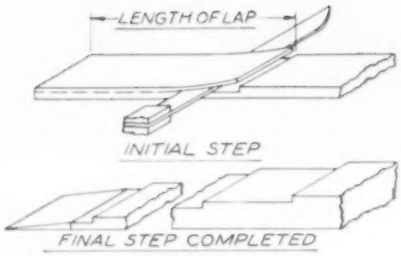


FIGURE 1.

Not all solid woven belting is of this type nor can all solid woven belting be cut and cemented. Therefore, care must be exercised that only the proper belt be used, otherwise failures are sure to result.

Many woven belts do not have sufficient tensile strength for power transmission nor are they of the proper construction to permit splicing. Once cut, they unravel, therefore, become useless. Only belting woven to the specifications established is recommended for these applications.

Once the proper size and grade belt is selected, the splicing procedure is somewhat similar to that used when splicing leather or rubber belts. The belt is cut to length, allowing for the splice and deducting for stretch. The ends are tapered to a feather edge, care being taken to step cut each ply as shown in Figure 1.

Reducing machine down time

After tapering the ends, they are prime coated with a solution made from solvent and cement. Upon drying, which requires from five to fifteen minutes depending on the size of the belt, a sheet of cement which has been immersed in solvent is placed between the ends of the splice and the belt is then securely clamped and allowed to dry. This is illustrated in Figure 2.

Drying time varies with the size of belt and room temperature. At a room temperature of 72° F. the clamps can be removed from a two-inch wide, four ply belt after 15 minutes of drying. About 15 to 20 minutes more of drying should be allowed before using the belt. This is necessary as the solvent in the cement at the center of the splice does not have an opportunity to evaporate in this time while the clamps are in place.

The entire cycle from cutting the belt to the time it can be used is about 30 to 40 minutes for a two-inch wide, four ply belt.

Machine "down time" on machines that require that the belt be cemented at the machine can be held to a few minutes by virtue of plan worked out at Westinghouse.

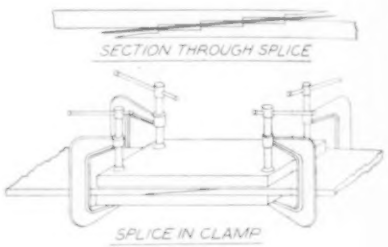


FIGURE 2.

On critical machines or where similar belts are used as in the case of drill presses and surface grinders, belts cut to length with ends tapered and primed are carried in stock by the belt department. Should a belt break, the beltman takes a stock belt, also a temporary belt to the machine. He installs the temporary belt which is mechanically fastened, and this permits the machine to be returned to operation.

The stock belt is then threaded on the machine and cemented and allowed to dry. When dry, the temporary belt is removed and the permanent endless cemented belt is slipped into place. The total "down time" is only a few minutes. Since cemented woven belts have been outlasting other belts to a considerable extent the number of trips made by beltmen has been greatly reduced.

This method of cementing woven belts has been in use at Westinghouse for a long enough time to make us certain of its value. Only a few of the many examples of its application in our own manufacturing departments have been cited. We feel sure that this development has been a definite aid to speeding war production if for no other reason than its reduction in the down time of war-vital machines.

THE END.

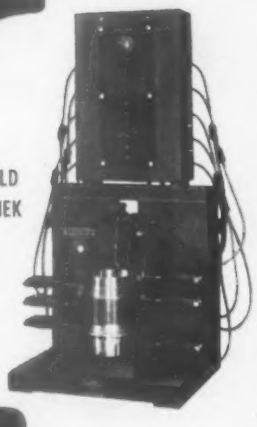
A lack of experience need not reduce inspection precision

It does require both skill and experience to handle close tolerance work on the time-honored fixed size gages—and skilled inspectors are scarce. But that need not interfere with precision in your plant.

Substitute for the gages that require skill, the gaging instruments which give you greater precision and at the same time eliminate the human factor. Sheffield precision gaging instruments in the hands of inexperienced inspectors are guarding product quality in hundreds of plants today.

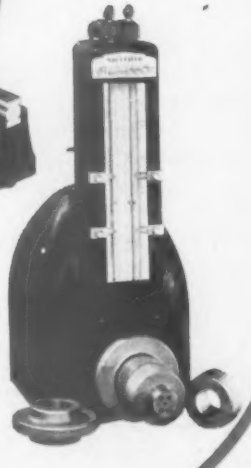
Write for descriptive folder No. 43-1.

SHEFFIELD ELECTRICHEK



SHEFFIELD MULTICHEK

SHEFFIELD VISUAL GAGE



SHEFFIELD PRECISIONAIRE

THE **SHEFFIELD** CORPORATION

DAYTON, OHIO, U. S. A.

SHEFFIELD GAGES — MASTER GAGEMAKERS

CORRECT SET-UP

The accuracy of a shaper cutter is no better than the accuracy with which it is mounted in the machine.

1. Be sure there is no play between shaper cutter and arbor.

2. Check concentricity with an indicator graduated to ten-thousandths. Maximum runout should not exceed 0.0005.

3. If runout exceeds 0.0005 in., unclamp and rotate the spacing collar—these collars usually having slight errors in parallelism.

4. Helix errors in tooth surfaces may be due to wear in ways guiding the spindle in the helical path.

5. When clamping the cutter in position, use the minimum number of spacing collars possible.

Additional helpful information is available in a booklet on gear shaping and shaper cutters. Ask for Bulletin GS-42.

SHARPENING

A sharp cutter will cut faster with less power and wear. It will produce more accurate work with better finish.

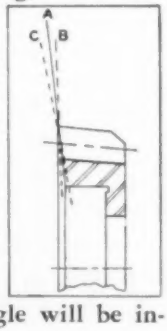
1. Use a soft wheel with medium grain. Keep wheel clean as a glazed wheel may crack cutter teeth.

2. Grinding too much metal at a time may cause heat-checks in the cutter teeth.

3. Never grind a cutter except on its face. "Touching up" sides or ends will alter the tooth form and spoil the cutter.

4. Be sure the cutting face is true with the bore. If not, cutting action will be irregular and tooth form changed.

5. Always grind to the correct face angle ("A" in drawing) as marked on the cutter.



If the angle is decreased ("B") the pressure angle will be changed and cutting efficiency decreased. If the angle is increased ("C") the cutting efficiency may be increased but the pressure angle will be incorrect.

CHECKING

Gear checking equipment should be such as to disclose the *exact nature* of the inaccuracy producing unsatisfactory gears.

1. Incorrect pitch diameter usually means machine-setting error or heat-treat distortion. Check with pins or balls.

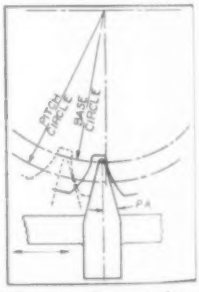
2. Variable backlash is usually due to eccentricity. Use a master gear in preference to an indicator, if possible. Also check cutters and their mounting for eccentricity.

Michigan Sine-Line Lead Checker

3. Tooth form and spacing should be checked together, since the former is not dependent on depth at which measurement is taken.

Michigan Sine-Line Involute Checker

4. Check the spiral lead rather than the helix angle, since the former is not dependent on depth at which measurement is taken.



Master Rack Tooth Simplifies Checking

5. Get a copy of "Better Gears" from Michigan Tool Company for detailed information on locating gear troubles.

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD . . . DETROIT, U. S. A.

New Materials and Methods for TOOL SALVAGE

Highlights from Three Important Addresses at the A.S.T.E. Convention by

L. C. GORHAM
GORHAM TOOL COMPANY

A. M. SETAPEN
HANDY & HARMAN

H. W. FOEGE
EUTECTIC WELDING ALLOYS COMPANY

Milling cutter salvaged through low temperature brazing with special alloy and flux saves time and money.

LOW-TEMPERATURE BRAZING

Citing work pioneered largely by The International Harvester Co., one of the world's largest users of perishable tools, H. W. Foege of the Eutectic Welding Alloys Co., New York, described the usefulness of low temperature brazing in both tool salvage and tipping cutters with high speed materials.

Low temperature brazing, he said, "requires patience and close attention to detail, but it will keep tools in use and show actual monetary savings, amounting in the case of one large user to some 14 per cent of the total cost of all tools. Individual savings may run as high as 50 per cent on some tools."

Foege believes that the greatest benefits from this process may be achieved only by establishing a tool repair center and placing all the work in the hands of only as many men as may be needed to keep all tools in repair.

"These men soon acquire the ability to use the brazing alloys at their proper temperatures, which is highly important as the operations are conducted at temperatures close to the point at which tools will lose their hardness," he said.

BRAZING ALLOYS

As brazing alloys, Foege offered Castolin Eutectic Low Temperature Welding rods. Those particularly adapted to tool salvage, he said, are: Castolin Number 16, with a binding temperature of 1,300 degrees F; Castolin Number 1,800, with a binding temperature of 940 degrees F; and Castolin Number 185, which has a binding temperature of 1,000 to 1,200 degrees F.

Of equal importance, he pointed out, are the fluxes used with these alloys. "They are known as Autochemic Flux and each alloy has its own flux in paste form. In addition to serving the usual functions of a flux, each has a melting point coinciding with the binding temperature of its companion alloy. It becomes fluid when the proper temperature for applying the alloy has been reached and thus serves as a temperature index."

These alloys, he said, are adaptable to other types of heating such as carbon arc, atomic hydrogen, furnaces, salt bath, resistance welders and high frequency induction. Used by other than torch or carbon arc or atomic hydrogen, however, higher temperatures are required, 1,800 degrees F and above for the Number 16 alloy and 1,200 degrees F for the Number 1,800 alloy.

Using these alloys, Foege stated that one major aircraft producer repaired an expensive broach which had broken on its fourth operation. At last report, it had performed 15,000 operations since being repaired.

He also pointed to substantial savings in cost through the use of low temperature brazing. A new spline broach cost $180. Cost of reclaiming was $4. Cost of a new reamer was $18. Cost of reclaiming was $3.

These figures, he said, include all time, material and overhead. The actual cost of the alloy used to make the joint did not in any case exceed a few cents.

SILVER BRAZING ALLOYS

Another material being used extensively in brazing for both tool salvage and manufacture is silver alloy. How tools can be returned to usefulness within an hour of breaking through the use of this method was described by A. M. Setapen, of Handy & Harman, New York.

"Low temperature silver brazing alloys are coming into wide usage for tool salvage work mainly because they have unusually low flow points and it is necessary to have only a thin film of alloy in the joint area in order to get high joint strength," Setapen said.

After describing the simple operations involved in tool repair and brazing high speed tool tips, he explained the method used in brazing cemented carbide tool tips with silver alloy.

"In brazing carbide tips," he explained, "it has been found that Easy-Flo Number 3 alloy gives the greatest joint strength. It is recommended by leading manufacturers of cemented carbide tool tips for use on tools where cutting heats do not go beyond 1,000 degrees F.

"First," he said, "all joint surfaces on both tip and recessed shank should be clean. Touch surfaces to be joined lightly against the flat side of a silicon carbide wheel until clean and then wipe thoroughly with carbon tetrachloride.

"Second, liberally flux the recessed shank surfaces, the carbide tip and the brazing alloy with Handy Flux.

"Third, cut a thin sheet of Easy-Flo Number 3 to fit into the recess or 'pretin' all surfaces of the recess. Then, place the fluxed tip into position.

"Fourth, apply torch heat to underside of shank so that heat soaks up to the carbide tip. Use a holding rod to keep the tip in position. Keep flame in constant motion to avoid hot spots, and do not apply flame to the tip at any time.

"Fifth, when the flux becomes clear and liquid, you are almost to brazing temperature. Just as soon as the tip can be moved on the molten film of alloy (which is free-flowing at 1,270 degrees F), withhold the heat and exert 'slight' pressure on the holding rod to insure a strong bond.

"Sixth," he continued, "as soon as the brazing alloy has solidified, cool slowly in powdered hard coal, asbestos, mica or lime in order to prevent cracking the tip during cooling. Do not cool by air blasting or oil quenching."

USE OF THE FURNACE

A controlled atmosphere furnace or closed type muffle furnace may be used for heating, Setapen said. For furnace brazing, he explained, the assembly is tightly wrapped with individual strands of nichrome wire.

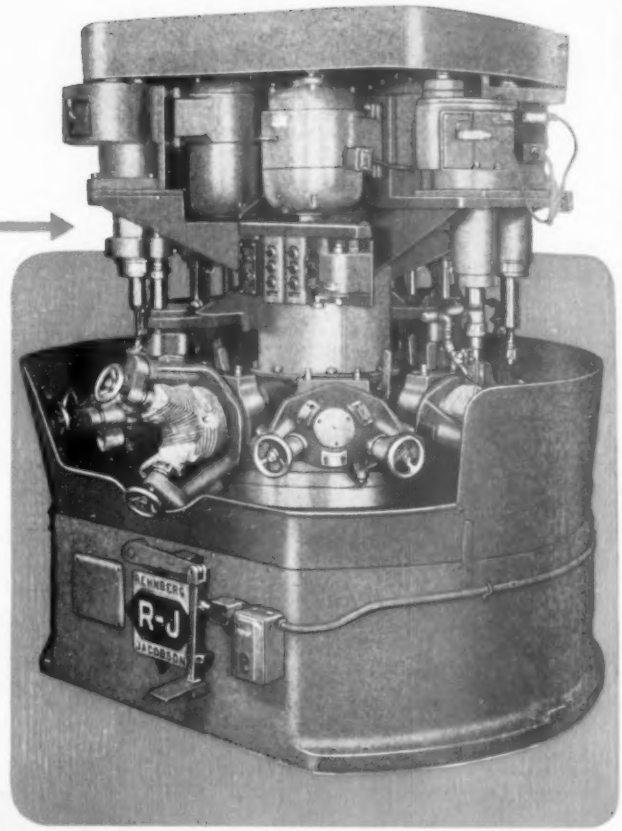
This brazing procedure, he pointed out, applies to cemented carbide tips

The silver alloy braze on this drill appears as a hair-line at the 13-inch mark on the yardstick. The drill is 3.625-inches in diameter.

REHNBERG-JACOBSON
Aircraft
PRODUCTION MACHINES

FOR ENGINE PARTS . . .

Here are two examples from a wide variety of machines which we have manufactured for the mass production of aircraft engine parts. R-J machine tools are serving satisfactorily in many prominent war production plants.

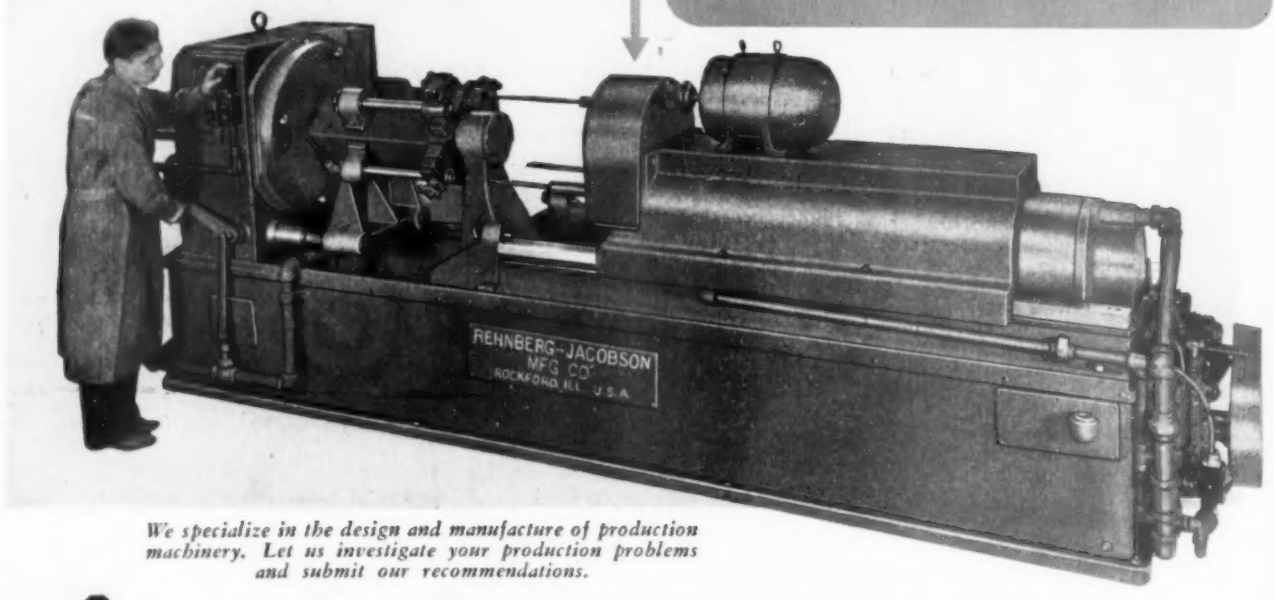


Center-Column Type

This spark plug hole machine typifies our center-column vertical type of construction. Essentially, it consists of standard R-J Drill Units and Tap Units working vertically on pieces carried on 2-position index fixtures on an 8-station index table. One position is for loading and one for indexing the piece 180° to bring the opposite side up. Each piece makes two trips around. The spark plug holes are each drilled through, rough bored and counterbored, reamed through, finish counterbored and countersunk, and tapped to depth. Complete electric controls provide master and individual operation of the units. Index is manually controlled.

Horizontal Type

This is a special indexing turret type reaming machine which produces an extremely precise job on finishing the hole in a starter and accessory drive shaft. There are three working positions and one for loading and unloading. The piece is reamed to .928" dia. part of its length, reamed to .555" the rest of the way, then these two diameters are joined with very accurate and smoothly blending form-reamed radii. Hydraulic drive is used on the 3-spindle tool slide and a high pressure pump system forces coolant through the work and past the cutting tools. Extremely fine finish is obtained.



We specialize in the design and manufacture of production machinery. Let us investigate your production problems and submit our recommendations.

REHNBERG R-J JACOBSON

REHNBERG-JACOBSON MANUFACTURING CO.
Special Machinery
2137 KISHWAUKEE ST. ROCKFORD, ILLINOIS

(Concluded from page 107)

under .75-inches. For larger and for irregular shaped tips, the 'sandwich' braze is recommended to reduce the brazing strains common to tips of larger size and irregular shape.

L. C. Gorham, of Gorham Tool Co., Detroit, revealed a new material and new technique for salvaging tools and lengthening tool life. The material is a welding rod of cast high speed steel.

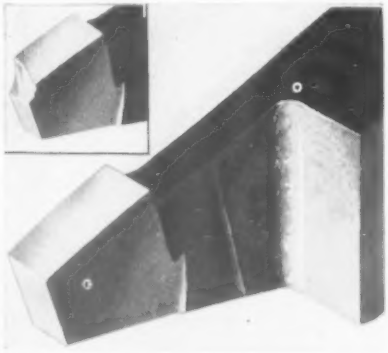
NEW WELDING METAL

"Gorham Welding Metal," he said, "is a cast ferrous alloy that incorporates the characteristics of High Speed Steel from the standpoint of toughness, while at the same time providing the wear resistance of cemented carbide. It has unique properties in that it can be used as welded, or it can be welded and drawn to increase hardness and toughness. The welded tool can also be annealed so as to be readily machined, and subsequently heat-treated and drawn.

"This variety of treatments," Gorham explained, makes it possible to produce tools and wear surfaces with a Rockwell hardness of 60-70 on the C scale, and also having unusual red hardness."

Typical of the many broken tools which can be reclaimed with this new welding metal, he said, are milling cutters. From one to a dozen teeth can be built up with this rod, reground and heat-treated without lowering the hardness of adjacent teeth. Lathe tools, broaches, reamers and other tools that are worn out or ground under-size may be similarly treated and salvaged, oftentimes securing a reclaimed tool that is better than when new.

By welding a layer of this metal on the wear surfaces and grinding to size, he said, it is possible to prolong indefinitely the service life of tools and machine parts.



Cutting tool reclaimed by welding. Broken corner was filled in with a new cast high speed steel.

New turning and special grooving tools may be made with this metal. To do this, he explained, mill or grind out the end of a piece of shank stock or machine steel and build up with successive layers of the metal. After grinding to size, the tool can be used as welded or it can be annealed and heat treated. On some jobs these welded tools have outlasted regular high speed tools from three to 10 times, he claimed.

The metal, which has been in use for five years in a number of large industrial plants, is easily applied by oxyacetylene process by any experienced welder, Gorham said. THE END.

Torpedo Manufacture at International Harvester

These women are inspecting ball bearings, the smallest used on the torpedo job being .125-inches in diameter. These must be sorted according to their size within 25 millionths of an inch.

Smallest machined part in the torpedo, shown mounted on a machine for grinding. An indication of its size may be gained from comparing it with the forefinger of the woman employe.

This part has two ground diameters, one .0635-inches, the other .053. Tolerances on one end are plus .000 and minus .001; and on the other end plus .0003 and minus .0000-inches.

IN utilizing womanpower to the fullest extent, as well as advanced manufacturing methods, the International Harvester Company was several months ahead of the date promised for starting production on aircraft torpedoes.

One of the most vital and effective weapons in the war plans of the United Nations, the application of mass manufacturing techniques to its production has been a newsworthy accomplishment.

Manufacturing and assembly operations on the highly intricate torpedo are being performed in several plants of the company.

Many details of the manufacturing techniques used in its production are closely guarded military secrets. But the Navy Department has authorized some interesting information about aircraft torpedo production.

The torpedo is unlike anything Harvester has manufactured before. While the company has handled manufacturing jobs that called for equal precision, notably in the Diesel fuel injection pump, it has never built any complete product where, throughout, the tolerances — or allowable margins of error — were as close as in the torpedo.

MORE THAN 1,000 PARTS

Torpedo production involves work as fine as the finest watch or compass. There are many small, delicate parts which must be machined and hand-finished to almost infinite tolerances and adjusted to extremely close fits. There are in excess of 1,000 parts in the torpedo. In the production of those parts, between 15,000 and 20,000 separate operations are involved.

The finished torpedo weighs less than a medium-sized tractor, yet, because of the close work involved, the total man-hours of work required to produce the torpedo are far greater.

Some of the most difficult jobs in torpedo production are the assembly work on small parts. Here the problems are very similar to assembly of a wrist watch, calling for patience, precision, and individual skill. Much of this work is done under a magnifying glass. A number of former watch makers are employed at this work, both to develop techniques and to train other employes.

The precision required in many instances is beyond human measurement, and goes beyond the ability of the finest instruments to measure. These delicate parts either fit or they don't, and if they do not there is no way of measuring the error except by "feel."

Some parts must be accurate within a limit of 25 one-millionths of an inch.

A number of parts are so small that a man can carry them under his finger nail, yet they must be machined and finished to exact dimensions.

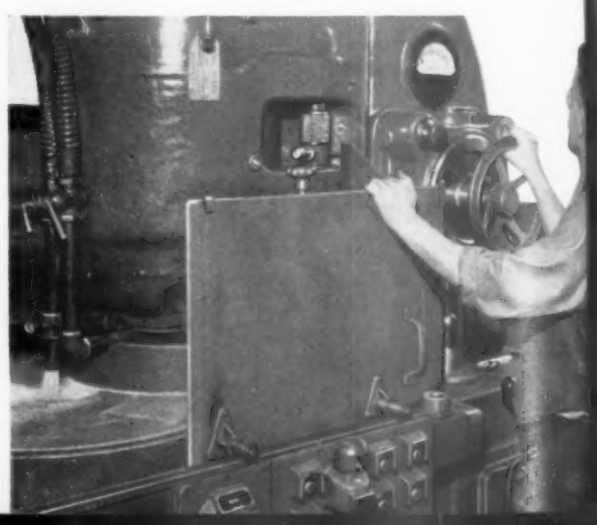
There are parts with fits so tight that a particle of dust on them destroys the accuracy required.

There are fittings so accurate that they are lubricated by drops of oil injected with a surgeon's hypodermic needle. The poise is so precise that a drop of oil injected on one side, and not on the other, would destroy the delicate balance.

Because of the many difficulties in the job, and the precision required, Harvester management and employees were proud that the first torpedoes completed performed excellently when given the final Navy tests.

The Harvester Company was one of the few manufacturers in the United

(Continued on page 112)



Blades for torpedo propeller tail cone are ground on this Blanchard surface grinder. Revolving table on which blades are placed is shown through the opening.

Final grinding must finish the blades to a tolerance of .0003 - inches. Magnetic action is used as a means for grinding the blade for exact uniform thickness.

(Continued from page 110)

States entrusted by the Navy with the building of torpedoes. In peacetime all torpedoes used by the Navy had been built by the Navy itself at its torpedo stations. But the requirements of war greatly exceeded the capacity of those stations.

Harvester received its assignment about a year ago. Whole departments of several plants were cleared of their peacetime facilities. In one plant, 2,000 carloads of stored materials had to be moved. These departments were refinished to afford maximum light for this precise work. Production lines were laid out; processes checked and analyzed; machinery, inspection, and assembly operations located; and procurement of machines and facilities was begun.

NAVY INSTRUCTS KEY MEN

One of the first things the company did was to send a number of key men to a naval torpedo station. These men lived and worked there for weeks, familiarizing themselves with every method and metal fabricating technique used by the Navy. The men spent their days in the shops of the torpedo station, watching Navy production, and then carried on their study in the evenings by holding classroom and discussion sessions. Other Harvester men were sent to the torpedo station in later classes.

Harvester officials who have been in charge of the torpedo production program give great credit to the Navy for this instruction, which had an important part in getting the company started on torpedo manufacture ahead of schedule.

Training of all employees on the torpedo job has been required to a considerable extent, the amount depending on the nature of the work. The men who were trained at the torpedo station also trained other supervisors and group leaders.

Special training was organized for new women employees who now figure importantly on the job.

Women are given a three-day refresher course in basic mathematics, especially in the reading of decimal fractions, in shop practice, and in the use of gauges and micrometers used in the measurement of torpedo parts.

Following this basic course, the women are tested and, if they pass the tests, are put on the job and given detailed training by men supervisors and group leaders.

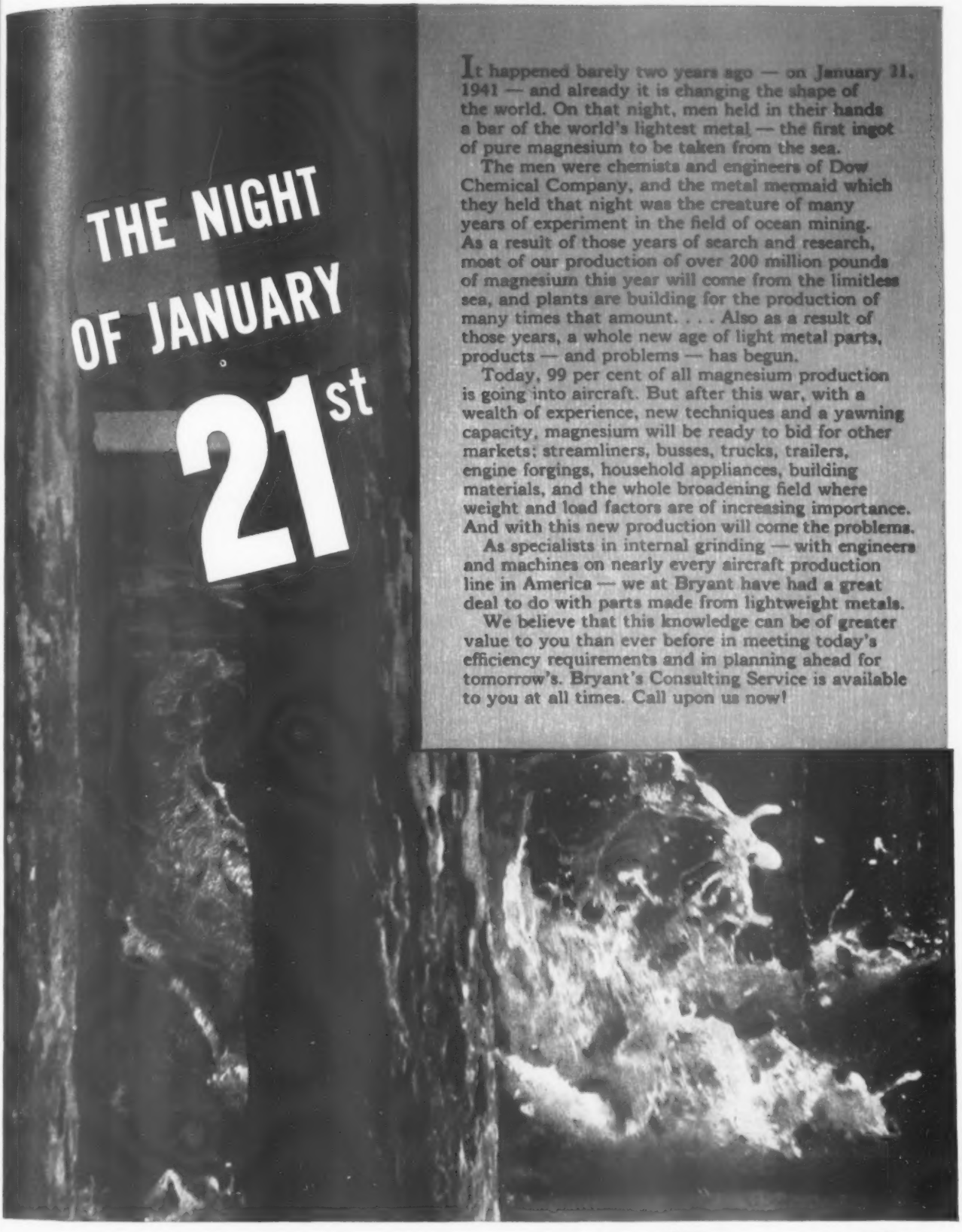
WOMEN'S SKILL PROVES USEFUL

Women inspectors have received more extensive training in mathematics, instrument reading, practice inspection, blueprint reading, and in the use of special inspection gauges.

Because of the close details and fine tolerances involved in this war job, all the physical and emotional attributes that have been found in women war workers are utilized to good advantage.

Women are used in parts sorting, inspection and fine assembly. A typical inspection job for women is the sorting of ball bearings, the smallest used being .125-inches in diameter. These must be sorted to size within 25-millionths of an inch.

Women are also used extensively at Harvester in machine tool operation. Women workers not only are operating a wide range of machine tools, but they have been trained in setting up machines and jobs. THE END.



It happened barely two years ago — on January 21, 1941 — and already it is changing the shape of the world. On that night, men held in their hands a bar of the world's lightest metal — the first ingot of pure magnesium to be taken from the sea.

The men were chemists and engineers of Dow Chemical Company, and the metal mermaid which they held that night was the creature of many years of experiment in the field of ocean mining. As a result of those years of search and research, most of our production of over 200 million pounds of magnesium this year will come from the limitless sea, and plants are building for the production of many times that amount. . . . Also as a result of those years, a whole new age of light metal parts, products — and problems — has begun.

Today, 99 per cent of all magnesium production is going into aircraft. But after this war, with a wealth of experience, new techniques and a yawning capacity, magnesium will be ready to bid for other markets: streamliners, busses, trucks, trailers, engine forgings, household appliances, building materials, and the whole broadening field where weight and load factors are of increasing importance. And with this new production will come the problems.

As specialists in internal grinding — with engineers and machines on nearly every aircraft production line in America — we at Bryant have had a great deal to do with parts made from lightweight metals.

We believe that this knowledge can be of greater value to you than ever before in meeting today's efficiency requirements and in planning ahead for tomorrow's. Bryant's Consulting Service is available to you at all times. Call upon us now!

Bryant Chucking Grinder Company

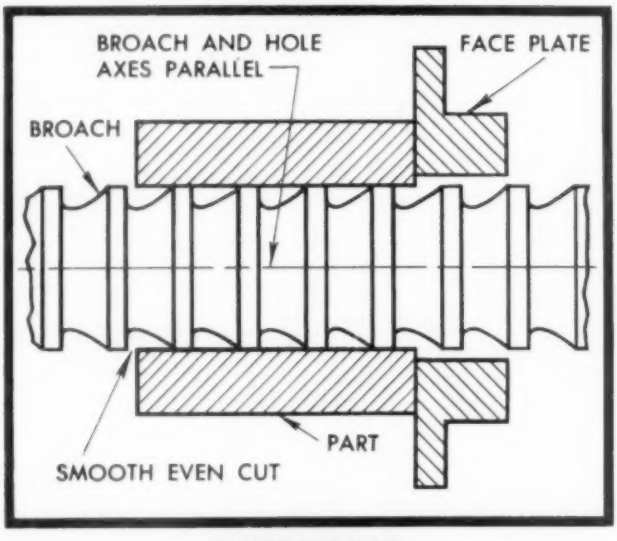
SPRINGFIELD, VERMONT, U. S. A.

SEND FOR THE MAN FROM BRYANT!

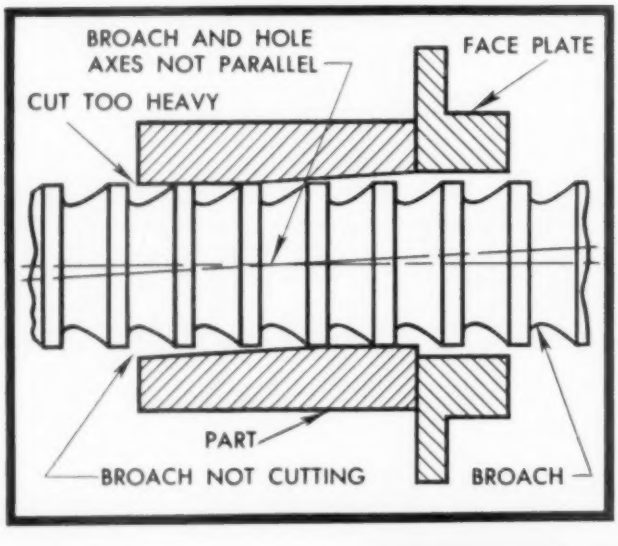
To Assure Maximum Broaching Efficiency

Be Sure PART HAS BEEN PREPARED CORRECTLY

CORRECT



INCORRECT



When broaching round holes it is very important that the axis of the broach be in perfect alignment with the axis of the hole being broached. This insures an even cut all around the circumference and an even stress on the broach.

The most important requirement in securing this condition is to have the hole square with the locating face. If the hole is not square strains will be set up which may cause breakage of the tool, or force it to cut too heavily on one side, and too lightly on the other, resulting in a hole not completely "cleaned up".

In those cases where squareness of the hole is not possible self-aligning face plate should be used. This will be described in a subsequent advertisement.

COMPLETE BROACH SERVICE

ARMY (E) NAVY

DETROIT BROACH COMPANY

20201 SHERWOOD AVENUE • DETROIT, MICHIGAN

CAPITAL COMMUNIQUÉ

T.M. REG. U.S. PAT. OFF.

JAY A. BONWIT

Washington Correspondent for
THE TOOL ENGINEER

LABOR has taken the spotlight in the production picture, with controls aimed at complete stabilization of labor supply and rigid wage freeze. Action is based on President Roosevelt's Executive Order of April 8.

While actions taken to combat inflation affect all phases of the economy, the brunt of the action is directed against labor.

Difficulties of management-labor relationships will be increased. It is obvious that inflation wipes out all labor gains, but a hard wage freeze is difficult to maintain in the face of increase in prices. The Executive Order, however, calls for a freeze on living costs, and administrative actions taken subsequent to the President's order will freeze most price levels and actually reduce some prices.

A long range view of the war economy, however, indicates a gradual increase in prices. Controls may be effective enough to avoid an inflationary spiral, but pressure of prices will increase the resentment of organized labor against a rigid wage freeze.

Further, the job freeze holds additional elements of friction between management and labor. The action was taken to prevent the excessive labor turnover rate which had plagued war industries. The War Manpower Commission edict, aimed at turnover, is a substitute for legislation which would accomplish a job freeze by law.

In view of the severity of the regulations on labor, it is generally indicated from Governmental sources that it will be necessary for management to take these irritating factors into account, and devise methods of maintaining plant morale and worker incentive.

* * *

There has been speculation as to the effect from changes in scheduling. WPB Chairman Donald M. Nelson indicated that the demands for steel ingot products—as reflected by the requests for products by the various claimant agencies under CMP—revealed a large excess of demand over supply.

Nelson pointed out that use of steel has always been an important index of the activity of industry, and that this was especially true during war.

In the opinion of WPB officials there will be problems in individual plants due to changes in scheduling, but the overall rate of industrial activity will remain at peak levels.

However, in considering the problem of adjusting plant operation to changes in schedules, possible loss of skilled labor to competing plants should be taken into consideration.

* * *

Discussion of post-war economy has focused interest on what industry can do to insure post-war position. The war has changed the method of operation of a large number of small and medium sized plants. In converting to war output, they have converted from a job shop to a production line operation. In many cases, these plants are high cost producers, and actually are in a better profit position due to high cost production.

The post war period will undoubtedly recreate the normal competitive factors usual to industry, and the problem arises as to how industry can plan to meet the post-war conditions. It is generally agreed that development of new and

(Continued on page 116)

(Continued from page 115)

efficient operations and products will be best insurance of a sound position in a highly competitive post-war market.

* * *

Civilian supply has been an important issue for several months. Concern over the civilian economy is based on the fact that the rate of manufacture has been much below the so-called minimum rate. However, this shortness of goods has been compensated for by the large stocks of goods still available. At the same time, it was considered necessary to plan production of certain repair parts and consumer durable goods at a rate consistent with a sound economy.

Proposals considered by Congressional committees to establish an agency separate from the War Production Board to represent civilian economy spurred Chairman Nelson to create a new Vice Chairmanship in WPB, and to raise civilian supply to "Division" status.

The new division will have three jobs —(1) to determine the amount of civilian production required to maintain the economy; (2) to obtain the materials required for production of these items, and (3) to follow through and see to it that the goods which have been authorized are produced.

* * *

An industry-wide drive aimed at conservation of tools is being organized by the WPB Conservation Division. Objective of the campaign will be for war production plants to study their tool handling problems, and adopt a tool care policy.

A portion of WPB statement follows:

"Such a policy would largely center around a strong tool handling educational plan in the plant training program for new employees. The necessity for training in tool care is becoming increasingly important as more and more "green" employees come on the job.

"Many of the factors that result in tool breakage and spoilage are elementary in nature, can easily be avoided if clearly explained to workers. In handling twist drills, for instance, the tight clamping of the parts to be drilled will help insure against uneven stress being placed upon the drill. A few extra seconds taken in "tightening" will keep an expensive drill in active service longer.

"When there is breakage, broken tools can often be reclaimed. They can be cut up into smaller pieces that are used as cutting tips, brazed into shanks made of non-alloyed steel, thus conserving the critical alloyed steels that would otherwise be required. This is a practice that has been adopted already by many plants and can be readily handled by many more. High-speed tool steels contain approximately 20 percent of the following highly critical alloying metals: tungsten, molybdenum, vanadim, chromium and cobalt.

"Widespread adoption of tool-tipping practices could mean a saving of 75 percent of the 36,000 tons of "tippable" tools estimated as being needed in 1943. The cutting tool is actually the fulcrum of most war industry, as cutting tools of one type or another are used in

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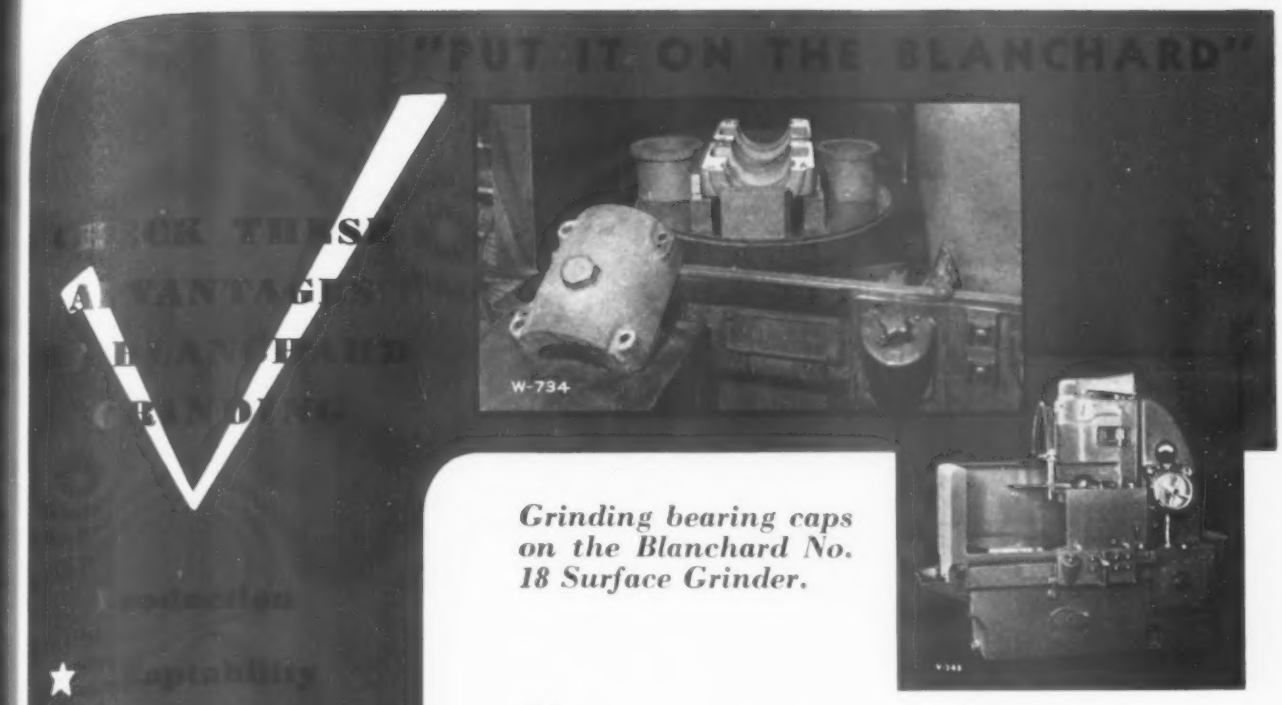


Grinding bearing caps on the Blanchard No. 18 Surface Grinder.

THE surfaces on these bearing caps were formerly milled in 34 to 40 minutes each — now they are Blanchard ground at the rate of 7 pieces per hour. The Blanchard No. 18 not only increases production, but decreases setting-up time and eliminates expensive fixtures.

The caps are laid on two parallel bars on the chuck. Smaller steel blocks are laid on top of them and against the caps. Two hollow steel rings against these blocks serve to hold the work sideways. A steel block is placed at each end and the magnetism is turned on.

¼″ of stock is removed from the cast iron bearing caps to limits of +.010″.

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE, MASS.

BLANCHARD

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

(Concluded from page 116)

processing most metal parts for the machinery of war."

★ ★ ★

Recent actions of significance to the metal cutting industry were as follows:

March 25 — Ferrocolumbium was placed under complete allocation through issuance of General Preference Order M-296, which permits the use or delivery of the metal only with WPB approval. Most important use of the metal is for certain types of stainless steels.

March 26—General Preference Order E-5-a, issued by WPB, controls the distribution of new gages and precision measuring hand tools, restricting sales and deliveries by producers or distributors to approved users, other distributors, and approved employees.

March 29—Deliveries of general steel products to warehouses and dealers are controlled through issuance of General Preference Order M-21-b-1. Purpose of the order is to provide adequate warehouse stocks of general steel products so that small and emergency needs can be filled promptly, and also to guard against unnecessarily large accumulations of stocks by warehouses and dealers.

March 31—WPB set forward to May 1, from April 1, the date after which deliveries on the Class X list, under General Scheduling Order M-293, may be made only according to schedules filed with WPB, and Class Y items only when authorized.

March 31—Office of Price Administration issues revision in method of determining the prices of second-hand machine tools. (See Industrial News Digest).

April 1 — Order M-21-b-2 issued, governing delivery of merchant trade steel products to distributors.

April 1 — Calcium metal, vital for metallurgical uses, was placed under allocation by WPB through issuance of General Preference Order M-303.

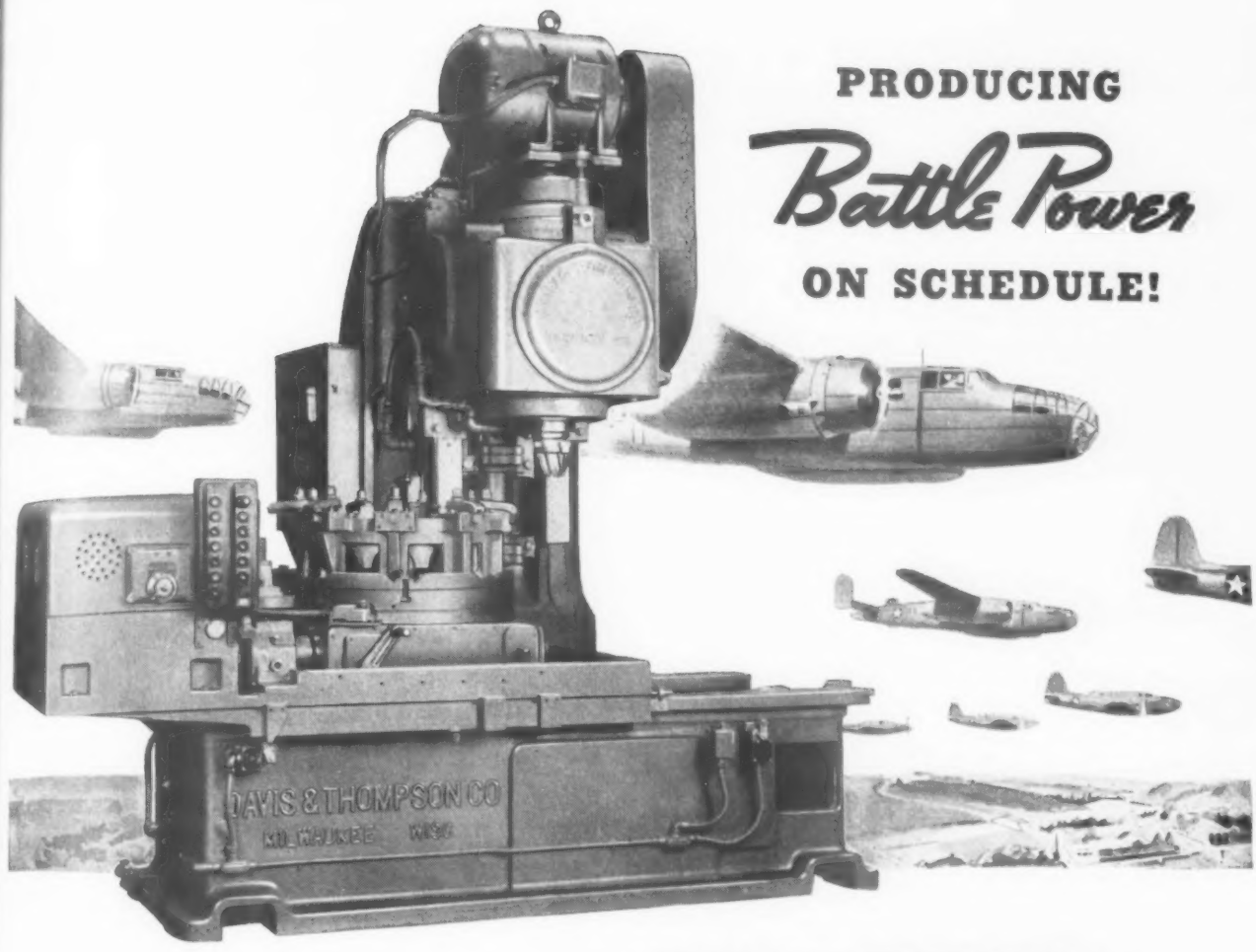
April 2 — WPB officials stated that preference ratings assigned by Controlled Materials Plan Regulation No. 5 may be used to obtain repair parts for office machinery and equipment.

April 6 — An arrangement permitting delivery of sample quantities of steel for experimental purposes to manufacturers or laboratories without regard to preference ratings or authorized controlled material orders was renewed by WPB for the second quarter of 1943. The arrangement is to stimulate use of plain carbon steel and National Emergency Alloy Steels.

April 7 — Hand file reconditioning was recommended by WPB Conservation Division, on the basis of survey conducted by the Tools Division, which showed substantial savings in high carbon steel and manhours as the result of using this procedure.

April 10 — WPB campaign announced to locate all idle electric motors and generators to get them into service.

THE END

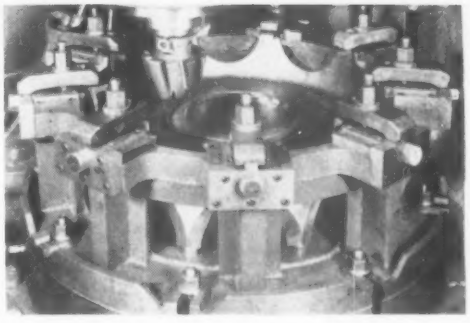


PRODUCING *Battle Power* ON SCHEDULE!

FULLY automatic, electrically controlled, hydraulically operated, this 34" open vertical type D&T miller speeds the contour milling of the inside of crankcases for radial type airplane motors, on the fastest schedule ever established.

All the operator has to do is load the part into the fixture, push the cycle button, and unload the finished crankcase. Rapid traverse speeds the table to approximate milling position. Rapid traverse lowers the head. Then, in "feed" speed, head and table move to precise operating position . . . the table rotates, the milling cycle is completed, the table backs away, and the head rises again to the loading position, ready for the next crankcase! All automatic . . . fast . . . accurate!

Thirteen tons of metal are engineered without waste into this smooth-working precision machine. It stands 12' 10" high . . . is remarkably compact, using floor space only 8' 4" x 5' 10" . . . has a husky 5⅞" spindle with 8⅞" flange, with change gears for various spindle feeds. Entire head equipped with frictionless bearings . . . precision roller bearings on spindle . . . ball bearings at all other bearing surfaces.



FULLY AUTOMATIC . . . FAST . . . ACCURATE

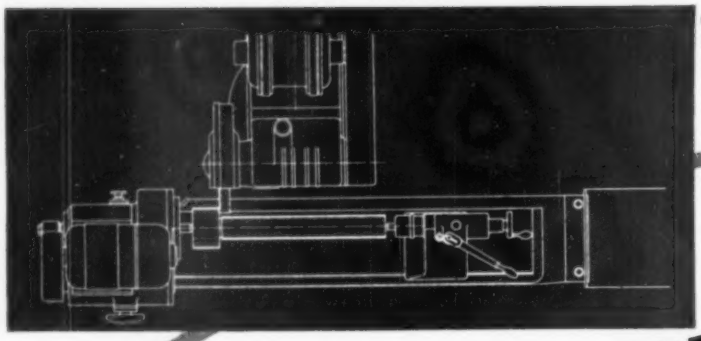
Similar machines, with rotary tables up to 87", mill large gear blanks, tank rings, and other big parts . . . fast!

Send for our "Victory Production" book. It cites many other typical examples of rugged, compact, automatic D&T multiple-spindle boring, drilling, milling machines specially designed for high production.

DAVIS & THOMPSON CO., *Milwaukee, Wis., U.S.A.*

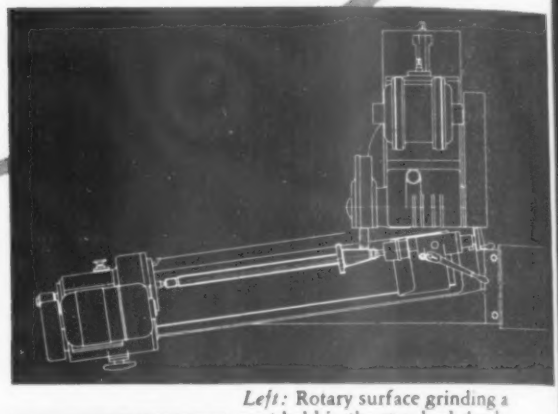
Buy More U. S. War Bonds

D&T ROTO-MATIC HIGH PRODUCTION MACHINERY



Conventional cylindrical grinding set-up, followed by grinding the shoulder.

WIDE VARIETY OF PRECISION WORK *Quickly Set Up and Finished* ON CINCINNATI HYDRAULIC UNIVERSAL GRINDERS



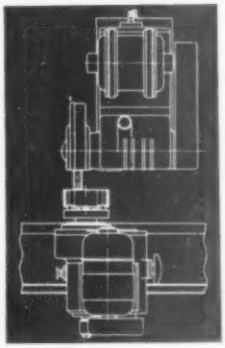
Set-up for grinding taper shank end of a milling machine arbor.

Left: Rotary surface grinding a part held in the standard chuck.

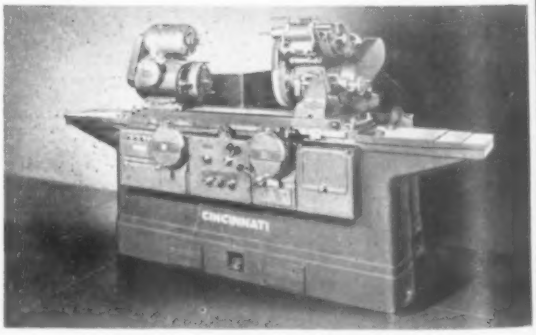
● Of the many factors to consider in the selection of a universal grinder, these two should receive first consideration: (1) how large a variety of work will the machine handle, (2) how fast can the work be accurately finished, including set-up time. An indication of the way in which CINCINNATI Hydraulic Universal Grinding Machines fulfill these requirements has been presented in the small illustrations on these two pages.

First of all, the CINCINNATI machine readily handles three basic types of precision tool-room grinding; cylindrical, internal, and rotary surface. Of course, many variations of these three classifications of work, such as steep tapers, may also be ground on the CINCINNATI. The second factor, set-up time, is exceptionally low for all types of work. For example, the internal grinding attachment may be set to grinding position by merely swinging it down and tightening one bolt.

All these features and many more are presented in catalogs which may be obtained on request: No. G-486 for the 12″ machine and G-474-1 for the 14″, 16″, and 18″ machines.



Above: Grinding the bore of a sleeve.



Above: CINCINNATI 12″ x 24″ Hydraulic Universal Grinding Machine.

CINCINNATI

CINCINNATI GRINDERS INCORPORATED CINCINNATI, OHIO

CENTERTYPE GRINDING MACHINES . . . CENTERLESS GRINDING MACHINES . . . CENTERLESS LAPPING MACHINES

Industrial News Digest....

A review of significant developments and new techniques in mass production industries.

February machine tool production declines slightly

The total value of machine tool units shipped during February showed a slight decline from the previous month, according to figures in a recent report released by the WPB's Tool Division.

The value of the 25,500 machine units reported shipped during the month was set at $114,372,000. This was a reduction of 2.6 per cent from the January figure of $117,384,000 for 26,000 machines.

Backlog: That builders are continuing to eat into the unfilled orders that once presented a serious bottleneck in the war production program is indicated by the fact that the backlog of orders shows a 7.9 per cent drop in value from the January figure.

The average time required to complete unfilled orders, according to the report, stood at 6.5 months at the end of February. The figure at the end of January was 6.8 months.

Alternative ceiling for used machinery announced by O.P.A.

An alternative ceiling for used machinery and second-hand machine parts, which is based, in general, on standard depreciation rates and allows sellers in some instances to obtain higher prices than existing maximums was announced April 6, by the Office of Price Administration.

To encourage sales: The new method of pricing and the new ceiling prices are expected to encourage the sale of older types of used machines and provide incentive for rebuilding them at a time when most of the newer second-hand models in dealers' hands have been purchased and put to use by war industries.

The pricing method is contained in Amendment No. 76 to Maximum Price Regulation No. 136 (Machines and Parts and Machinery Services), and became effective April 10, 1943.

Also included in the Amendment are provisions for, (1) the sale of machinery leased by the Defense Plant Corporation to its lessees or to other firms, (2) for sales between corporations entitled to file affiliated returns under the Internal Revenue Code, and (3) for sales of machines sold only on a delivered or installed price basis.

Shipbuilding records broken; Airplane goal stands

All shipbuilding records were broken during the past year, according to the annual report issued by the Maritime Commission. The industry exceeded by a considerable amount the 8,000,000 tons asked for by President Roosevelt in his mandate to the industry, the Commission declared.

Outlook: According to the Commission, American shipbuilding gives promise that it will be able to more than double, before the end of 1943, its record of more than 8,000,000 dead-weight tons during the past fiscal year.

Subsequent to the report, the Maritime Commission announced that the shipbuilding goal for 1943 has been currently set at nearly 19,000,000 dead-weight tons, and adds that this can be stepped up to 20,000,000 dead-weight tons, the present shipyard capacity, if materials and supplies are available.

* * *

Plane goal: WPB Chairman Donald Nelson has disclosed that there is no thought of reducing the Government's goal of approximately 100,000 warplanes in 1943.

This goal has been described as twice as many airplanes as were produced in 1942, with about four times the total tonnage, indicating a greatly increased number of heavy bombers.

New Curtiss-Wright propeller factory in production

The nation's largest and possibly most completely conveyorized propeller plant, the newly enlarged factory of Curtiss-Wright Corporation's Propeller Division in Indiana, has just swung into full operation.

It is geared for high-speed production of propellers for United Nation's fighting planes.

Structure: The new Indiana plant, a huge windowless building constructed of brick but employing wood trusses, is one of four factories of the Division now producing propellers. The other plants are located in New Jersey and Pennsylvania.

Conveyors Speed Production

Interior of the new Curtiss-Wright Corp. propeller factory in Indiana. "Cuffs" for Curtiss Electric Propellers are carried by conveyors through a series of intricate assembly operations. The factory is considered the most completely conveyorized propeller plant in the United States.

The new Indiana factory was expanded through the erection of considerable area designed to achieve as nearly as possible straight line production and to assure the most efficient use of each man-hour expended. Described as the

(Continued on following page)

(Continued from page 121)

most completely conveyorized propeller plant in the nation, the factory is equipped with miles of conveyors which have practically eliminated the old method of trucking production materials from one department to another or within departments.

The innovations which help speed propeller production include a slat conveyor extending hundreds of feet along which employes assemble gears and cuffs to the blades before final assembly, a paint shop which automatically controls the mixing and distribution of paint and in which blades and other parts are carried through spray booths and drying ovens by means of conveyors; and a belt conveyor which eliminates all trucking in the hauling of cuff parts.

Finished parts are delivered from the storeroom to all assembly departments on a 3,400-foot overhead conveyor, each tray numbered with its destination station. In the power unit and hub assembly departments materials are moved toward completion on roller conveyors.

Hundreds of feet of monorail with electric lifts speed the final assembly of completed propellers and carry them through the delicate balancing operations. The propellers are disassembled, placed on trucks and pulled to the shipping department by another conveyor, being automatically weighed enroute.

Unloaded from these trucks on monorails, the propellers are packed in wood boxes, and are carried on still another slat conveyor. At the end of the line, the crate is automatically up-ended, picked up by a bridge crane and placed in a railroad car for shipment.

Every feature of the plant is designed to expedite production, according to Robert L. Earle, vice president and general manager of the Division.

●

Production Idea Wins Award

Ed Thomas, left, Warner & Swasey worker receives award and congratulations from company president Charles J. Stilwell.

For months, Ed Thomas of the Assembly Department, The Warner & Swasey Co., Cleveland, had been tapping the holes in hexagon turrets as a hand operation.

In the days when 75 turret lathes was the production goal for a month, tapping these holes was necessarily a hand operation. However, with several hundred lathes the present production rate, it occurred to Thomas that a machine could do the job equally well and faster. He made the suggestion and received a $1,000 War Bond.

(Continued on page 124)

(Continued from page 122)

Business Notes: Purchases, expansions and new services

Expansion: Talon, Inc., Meadville, Penna., makers of Talon Slide Fasteners, has purchased controlling interest in the stock of Electroweld Steel Corp., Oil City, Penna.

The latter company has made outstanding progress during the past year in the manufacture of pressure and mechanical steel tubing on the world's most modern resistance weld tube mills.

Production of tubing will continue in the Electroweld plant at Oil City, and no changes in products or management are anticipated. Electroweld tubing is manufactured from strip steel which is accurately formed and welded. This product meets demands for boiler, condenser, heat exchanger and mechanical applications. The capacity of Electroweld steel approximates 6,000 tons per month, and is geared entirely to the manufacture of pressure tubing for war purposes.

* *

Name change: The Standard Manufacturing Co., of Corning, N. Y., has announced a change in its name to the Hungerford Corp.

Established in Corning in 1886, it has moved to a new plant in nearby Big Flats, N. Y. The plant is now engaged in sub-contracting manufacture for the Army Air Corps.

* *

New service: The distinction of being one of the first steel treating companies to establish a metallurgical department within its own organization is claimed by Sal-Way Steel Treating Co., Detroit.

This new department is headed by Sam Ramsey, who comes from General Motors' AC Spark Plug Division. He has had wide experience in production parts and cutting tools.

Desiring to assist users in utilizing critical materials, particularly in precision cutting tools, to the best advantage, Sal-Way believes it is helping the war effort materially in providing this specialized service to those who have problems dealing with tool heat treating.

* *

Doubled capacity: To maintain prompt deliveries of precision grinding wheels and to continue to give rapid service on special orders, the Universal Wheel & Abrasive Corp., will, for the second time in six months, double its furnace capacity.

Announcement of the new production facilities was made by Walter S. Baer, president of the corporation. The concern credits its deliveries of a few days to a week to specially-built furnaces and a secret bonding process which eliminates one of the slow-ups in grinding wheel manufacture.

Anniversary: The Dumore Co., of Racine, Wisconsin, celebrated its 30th birthday March 11.

The assembly lines where fractional horsepower aircraft motors and precision grinding tools are built were not slowed for celebration of the milestone. There was some recognition of the event, however, in that at noon birthday cakes were given to employes and special booklets were distributed.

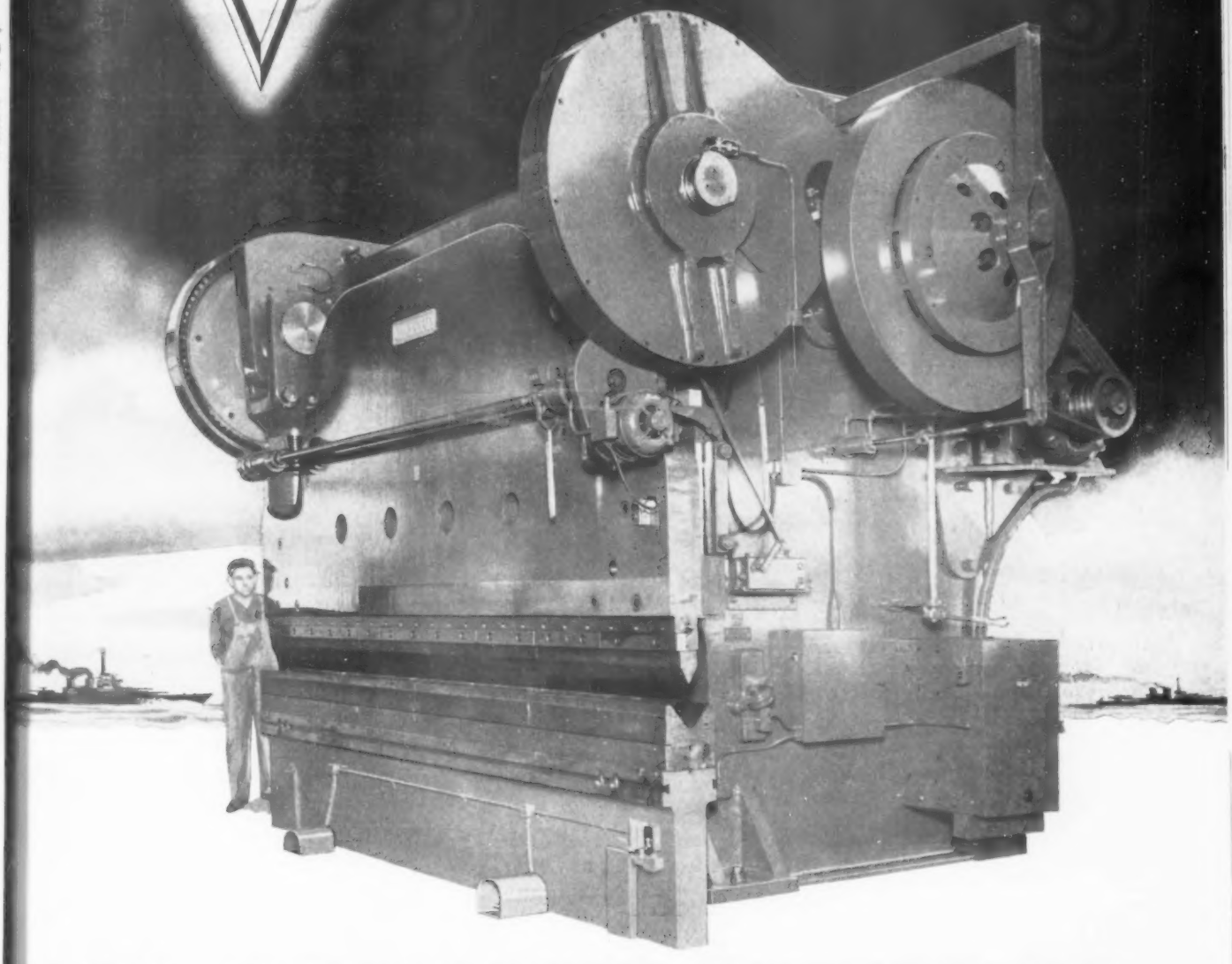
L. H. Hamilton, president and founder of Dumore was prevented by ill health from attending the celebration.

(Continued on page 127)

12 feet of 1 inch plate, *cold*...

or **20** Feet of ¾-inch plate are large capacities . . . But are standard for 500 Series Cincinnati Press Brakes. Day and night, Cincinnati Press Brakes, quickly and accurately, form plates in navy yards, shipyards and other industries for Victory on land and sea. • • • • • • • •

Write for CATALOG B-1, illustrating complete line and many uses of Cincinnati Press Brakes



THE CINCINNATI SHAPER CO.

CINCINNATI OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

CASTING CRATERS Disappear Like Magic

With EGYPTIAN MACHINE TOOL FINISHING SYSTEM

Those annoying little flaws in the surface of every machine tool casting can be hidden only if a smooth finish is used by an extensive many-coated system, now taboo by WPB Limitation Order No. L-108.

The EGYPTIAN 3-coat System gives a rough stipple finish which camouflages all casting craters, gives adequate protection to the metal, and a pleasing appearance, with speed and economy.

Consider these outstanding advantages of EGYPTIAN MACHINE TOOL SYSTEM:

1. Application directly on clean bare metal. No primer.
2. Applied with gun or brush.
3. Complete hiding.
4. Air-dries quickly at room temperature.
5. Oil and alkali resistant.

Do you use Government "Spec" finishes? If so, you will want a copy of the EGYPTIAN 1943 U.S. GOV'T SPECIFICATION FINISHES, called invaluable by prominent manufacturers and government departments.

Just ask for "Spec" Book TE

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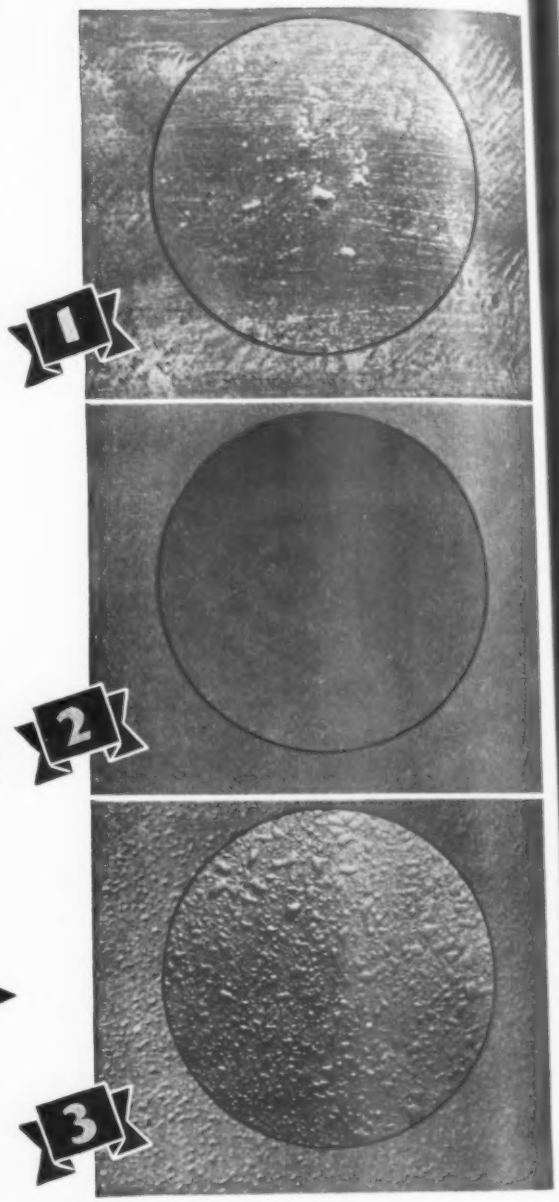


These unretouched photos with parts within circle actual size show: 1. Bare Casting. 2. Same surface after one pressure pot spray coat has been applied. 3. After application of medium stipple second coat over first coat. Left half shows surface after a coat of Machine Tool Enamel has been applied over two previous coats.

EGYPTIAN FINISHES

THE EGYPTIAN LACQUER MANUFACTURING CO.
ROCKEFELLER CENTER—NEW YORK, N. Y.

EGYPTIAN Superior FINISHES

(Continued from page 124)

Motor Manufacturing Memos: New war products revealed

In scope the automotive industry is "big business", but in composition it is mainly "small business".

Actually, the plants that produce finished motor cars in peacetime and produce finished tanks, guns and airplane engines in wartime are only part of the industry. The industry reaches out to 31 states and embraces nearly 1,000 manufacturing plants.

Future: While this number includes the major parts makers and other subcontractors, the list of 1,000 plants doesn't embrace all parts of the industry. The industry has expanded its subcontracting practices since the war began and "many an obscure little company" in recent months has become a supplier to automotive prime contractors.

Major Gen. Levin H. Campbell, chief of Ordnance, recently praised the automotive industry for its work in fostering and keeping alive the small shop.

Periphery of the industry extends beyond the companies that make the axles, the valves, the wheels and the thousands of other bits and pieces which flow into automotive plants for assembly into finished products.

It includes the companies that make the tools — machine tools, gages, jigs and fixtures and intricate dies. Tool and die shops serving the automotive and related war production industries have increased three-fold in number during the war period. (See THE TOOL ENGINEER, August, 1942. Pg. 78.)

Before the automotive industry could attain its present production rate of nearly $1,000,000 an hour on war materiel, thousands of machines and tens of thousands of machine accessories had to be designed and built. These accessories to the machine, which make possible interchangeability of production parts, are the responsibility of the tool and die industry.

"When the war finally ends," a spokesman for the Automotive War Production Council told us recently, "the tool and die companies will be hard at work preparing the machines of the industry to turn out products of utilization rather than of destruction.

"It will be the tool man who will be the determining factor in the length of time it takes to make automobiles, washing machines, radios, vacuum cleaners and a host of other items available to the consumer."

* *

AC Spark Plug: There are real postwar implications in the flexibility American manufacturers are demonstrating in their ability to convert to war production. One excellent example is found in the ingenuity shown by General Motors' AC Spark Plug division in mass producing Sperry automatic pilots, one of the most complicated and precise of all American war products.

Starting from scratch, less than a year ago, this plant is today well ahead on its production schedule. As automotive parts suppliers, plant officials somewhat sardonically ascribe their flexibility to their experience in peace times, when the design engineers finally let them in on model changes — about a month before the car was to be introduced to the public.

Perhaps the best example of postwar prognostication may be had from a remark dropped to a Tool Engineer writer by a machine operator in the plant, accustomed to working in thousandths, and occasionally in tenths. Producing a part for the automatic pilot, and experiencing some difficulty, he said, "Give me .00005-inch and I'll be all set."

This precision built instrument has many tolerances set up where nothing is allowed on one side of zero and a thousandth or less on the other. And there are zero tolerances on some parts. Yet the product is being mass manufactured. Thus it has been necessary to develop a smooth sequence, for any interruption of flow was like damming a river. Parts piled up and spilled all over the plant, with a serious disruption of morale.

A notable lesson in maintaining morale was learned from this and similar experiences in production stoppage which was related to the problem of maintaining worker momentum despite design changes.

Now, when a part is altered, generally in accordance with government specifications, production is continued on the old part until the new tooling or production set-up is accomplished. The changeover is made without a hitch and there is no production lag, a once serious problem. Worthless parts are far less waste, apparently, than the value gained from maintaining new part production through worker morale.

To protect bearings from dust, dirt and moisture they are installed in the automatic pilot under glass at General Motors' AC Spark Plug division. The bearing is handled with a special fixture, shown in the operator's right hand.

Another morale factor has been the attitude of the plant shown toward the job itself. Everything appears to have been done to translate production into terms of a fighting front. Inspectors "OK" tags carry a "Distinguished Service" citation and rejection slips are labeled "Defeat Tag."

Talk to AC workers as we did and you find there is a real spirit of the fighting front.

Plant managers have adapted automotive production techniques wherever possible. Jigs and fixtures are similar to those seen in pre-war production, except that many of them have been developed to finer fits, closer tolerances.

A typical drill jig, using color spotting on the bushings for identifying locating pins which will set the surface plate in proper relation to the spindle, permits drilling of holes within .001 inch relation to each other — between

Because of the effect of heat and cold in expansion and contraction, it is necessary to keep this cylindrical grinder running 24 hours a day, seven days a week to assure a constant temperature in finishing parts for the automatic pilot.

centers, and produces to within .0004-inch on size.

Assembly of this highly intricate instrument is done in a room which is as free from dust as it is humanly possible to make it. Certain parts are assembled under glass hoods. Women workers are employed 100 per cent in this department, and wear linen coats because less lint is produced. Windows are welded shut to assure that there is no infiltration of dust-laden outside air.

* *

Fisher Body: From auto bodies to airframes is the story of war conversion in this General Motors division.

The activities of the Detroit Aircraft Unit, fabricating and sub-assembly plant for Fisher Body's main aircraft plant, is a good example of the story behind the scenes in mass-production aircraft manufacture. It is even more significant as an example of how completely the motor car industry has turned its manufacturing facilities upside down in the past year.

"The average person looks at a plane and sees two wings, the main fuselage, engines, and landing gear, "the concern's general manager, E. F. Fisher told us. "What he doesn't see are the thousands of small parts, sub-assemblies, attaching parts, controls, heating and ventilating ducts, and hundreds of similar items."

New jobs: In the Detroit Aircraft Unit alone, not including the company's main aircraft plant as well as others participating in the production of the medium bomber for which Fisher Body is manufacturing a major portion of the principal sections, some 5,000 detail parts are turned out.

One of the smallest parts, a clip, is only .5-inch square. But between 400 and 500 of these clips are needed in each plane. They are so light that 300 of them weigh a pound, yet it requires three individual operations to make each one — and each must be held to an extreme tolerance.

Thirteen different kinds of oil and heat ducts are made at this one plant. A completed ship uses some 25 feet of such unseen but vital ducts, and each has to be cut from raw stock, stamped to shape, formed, flanged, heat-treated, straightened, spot welded, riveted and covered. These operations do not in-

(Continued on page 128)

(Continued from page 127)

clude fabrication of elbows and shafts within each duct.

Automatic painting of loft lines on a fuselage frame section to determine rivet location on final assembly is a Fisher development 20 times faster than hand methods.

In the main upper pedestal assembly there are 103 parts. This is the main control assembly for the plane, and thousands of operations go into it alone. So delicate is this assembly that the parts are not made on an interchangeable basis; instead, because of the watch-like nature of the assembly, the parts are hand-fitted for each. So sensitive are parts of the controls that shims .001-inch thick are used to increase or decrease the drag or pull of the controls.

Nearly 50 different kinds of fairing strips are manufactured at the plant. These are strips which brace joints in the plane. They vary in length from six inches to seven feet. Each strip, regardless of its size, must be cut, formed, shaped, drilled, countersunk, burred, and checked.

Countless ribs go into every plane, no two of which are similar. Serving as braces in such main sections as wings and fuselage, the ribs vary in length from five inches to two feet. Yet each one has to be cut to size, stamped, pressed, drilled, flanged, burred, and heat-treated. All have to be checked and straightened to a template. Lightning holes must be cut in each rib, and depressions stamped into them for added strength. A total of 407 such parts are made in this factory for the bomber wing.

Big Production: One of the vital but hidden parts of a bomber are the tee bolting angles. These are the basic angles to which the remainder of the airframe is built. They must be accurate in all dimensions of contour and shape.

There are 12 to each medium bomber, and they range in length from three to six feet. In addition to being cut, rolled, straightened, and shaped, from 65 to 75 holes must be drilled in each tee bolting angle. The holes are held to extreme tolerances for a variance means that all other parts of the ship will be out of balance.

More than 3,000 parts and small subassemblies are shipped daily by this one Fisher unit to the main aircraft plant for incorporation in major sections, while almost as many are delivered to the final assembly plant.

Such is the work of only one unit in the converted auto industry.

(Army-Navy "E" Awards on page 130)

GET THIS Free HELP FOR YOUR SCREW MACHINE OPERATORS!

A FEW PRACTICAL SUGGESTIONS FOR MORE EFFICIENT SCREW MACHINE PRODUCTION

Today, when every minute counts, it is more important than ever that you get absolute maximum efficiency from your Automatic Screw Machines, and that your operators fully understand the correct use and proper maintenance of their machines. To help screw machine users with today's production problems, Greenlee Bros. & Co. recently issued a series of "Greenlee Automatic News" trade paper advertisements containing many helpful ideas and production short cuts for operators. ● In response to numerous requests for extra copies, enlarged reprints of four of these "Greenlee Automatic News" advertisements were made and are now available, without charge, to all screw machine users. Send today for your free supply of these 11"x15" enlargements for distribution to your operators and for display in the shop.

Send for Free Copies of These 4 Greenlee Ads

1 14 PRACTICAL SUGGESTIONS FOR THE INEXPERIENCED SCREW MACHINE OPERATOR

Here's an advertisement packed full of operating tips to help save vital production minutes. For the inexperienced operator, and the skilled operator as well, these 14 suggestions can help reduce lost time, eliminate many spoiled pieces, and speed up war production.

2 INCREASING SCREW MACHINE PRODUCTION THROUGH PROPER TOOL CONTROL SYSTEM

This detailed story of how one manufacturer was able to increase production more than 25% by establishing and maintaining an efficient tool control system, contains many valuable suggestions that can be put to use in any screw machine department, large or small.

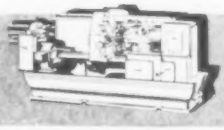
3 CORRECT APPLICATION OF CUTTING FLUID INSURES LONGER TOOL LIFE

An important factor in obtaining maximum tool life is the correct application of the cutting oil to the tool and work. This advertisement contains many valuable suggestions for the screw machine operator on the right and wrong methods of selecting and applying cutting fluid in automatic screw machine work.

4 SUGGESTIONS FOR CHANGING AND ADJUSTING COLLETS ON GREENLEE SCREW MACHINES

To help the screw machine operator save valuable seconds when changing and adjusting collets, here is a detailed discussion of the correct procedure to be followed when changing and adjusting collets on the Greenlee Screw Machine.

GREENLEE BROS. AND CO.
1944 MASON AVE. • ROCKFORD, ILL.

GREENLEE  *Automatic Screw Machines*

ARMY-NAVY "E" AWARD WINNERS

FOR EXCELLENCE IN WAR PRODUCTION

ALLEGHENY LUDLUM STEEL CORPORATION
West Leechburg, Pennsylvania

ALLIED PRODUCTS CORPORATION
Victor Peninsular Division
Detroit and Hillsdale, Michigan

ALLIS-CHALMERS MANUFACTURING CO.
Supercharger Plant,
Milwaukee, Wisconsin

ALLOY STEEL GEAR AND PINION CO.
Chicago, Illinois

AMERICAN ALUMINUM WARE COMPANY
Newark, New Jersey

AMERICAN FOUNDRY EQUIPMENT COMPANY
Mishawaka, Indiana

AMERICAN GEAR & MANUFACTURING CO.
Chicago, Illinois

AMERICAN HYDRAULICS, INC.
Sheboygan, Wisconsin

AMERICAN LAUNDRY MACHINE COMPANY
Cincinnati, Ohio

AMERICAN SCREW MACHINE PRODUCTS, INC.
Chicago, Illinois

BALDWIN LOCOMOTIVE WORKS
Eddystone, Pennsylvania

BORG-WARNER CORPORATION
Mechanics Universal Joint Division
Rockford, Illinois

THE COLUMBIAN VISE AND MFG. CO.
Cleveland, Ohio

THE CINCINNATI PLANER COMPANY
Cincinnati, Ohio

CHICAGO ROLLER SKATE COMPANY
Ware Brothers Division
Chicago, Illinois

CURTISS-WRIGHT CORPORATION
Propeller Division,
Caldwell-Clifton, New Jersey

DAHLSTROM METALLIC DOOR COMPANY
Jamestown, New York

EATON ENGRAVERS MACHINERY CORP.
Sag Harbor, Long Island, New York

E. I. du PONT de NEMOURS & CO., INC.
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ECLIPSE COUNTERBORE CO.
Detroit, Michigan

ECLIPSE LAWN MOWER COMPANY
Prophetstown, Illinois

FIRTH STERLING STEEL COMPANY
McKeesport, Pennsylvania

GENERAL ELECTRIC COMPANY
Everett Supercharger Department
Everett, Massachusetts

GILLETTE MACHINE & TOOL COMPANY
Hollywood, California

GENERAL MOTORS CORPORATION
Buick Motor Division
Flint, Mich., and Melrose Park, Ill.
Chevrolet Motor Division
Tonawanda and Buffalo, New York
Delco-Remy Division
Anderson, Indiana

HARRISON RADIATOR COMPANY
Lockport, New York

THE GENT MACHINE COMPANY
South Euclid, Ohio

THE B. F. GOODRICH COMPANY
Clarksville, Tennessee

IRWIN AUGUR BIT COMPANY
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LOWELL WRENCH COMPANY
Worcester, Massachusetts

THE LUFKIN RULE COMPANY
Saginaw, Michigan

LADISH DROP FORGE COMPANY
Cudahy, Wisconsin

LOUISVILLE TIN & STOVE COMPANY
Louisville, Kentucky

MONSANTO CHEMICAL COMPANY
Longhorn Ordnance Works,
Marshall, Texas

MOREY MACHINERY CO., INC.
Astoria, Long Island, New York

MCQUAY NORRIS MANUFACTURING CO.
St. Louis Ordnance Plant,
St. Louis, Missouri

NORTHWEST METAL PRODUCTS COMPANY
Kent, Washington

OHIO FERRO-ALLOYS CORPORATION
Philo, Ohio

PLOMB TOOL COMPANY
Los Angeles, California

RAU FASTENER COMPANY
Providence, Rhode Island

GEORGE E. ROPER CORPORATION
Rockford, Illinois

RODNEY MILLING COMPANY
Kansas City, Missouri

RUST PROOFING & METAL FINISHING CO.
Cambridge, Massachusetts

SPENSER THERMOSTAT COMPANY
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THE L. S. STARRETT COMPANY
Athol, Massachusetts

STUDEBAKER CORPORATION
Aviation Division,
Chicago, Ill.; Fort Wayne & South Bend, Ind.

TRAYLOR ENGINEERING & MFG. CO.
Allentown, Pennsylvania

UNITED STEEL & WIRE COMPANY
Battle Creek, Michigan

HARDINGE

SPECIFICATIONS:
1" collet capacity, 6" step chuck capacity, 5" jaw chuck capacity, 9" swing, eight spindle speeds up to 4000 R.P.M.

HIGH SPEED PRECISION
SECOND OPERATION MACHINE

• A common error of production departments has been the purchase of large, expensive machines, capable of performing many operations — and then confine them to one use — second operation work. Immediately, the purpose for which the machine was purchased — many operations — is defeated.

Now the trend is to Hardinge — designed only for second operation work. The initial low cost, the versatility and unusual capacity, without the set-up complications involved with large machines, created an ever-increasing demand for this machine.

The double tool cross slide and turret take standard tooling. The six-position tilted turret has an automatic indexing and locking head with six independent travel stops.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR

HARDINGE
ELMIRA, N.Y.

DIVING SPEEDS require Extra Safety

. . . as with MICROHONING

When *diving motors* "rev" up to 5600 r.p.m., the entire success of a mission may depend upon having an extra margin of safety in critical bearing surfaces. These surfaces are not completely safe unless extremely accurate, and "structurally perfect"—entirely free of microscopic cracks and disturbed subsurface material which induce fatigue failure.

MICROFINISH HONING is providing such surface quality in regular high production because—

It does not generate injurious frictional heat—hence avoids cracks.

It does not disturb or weaken subsurface material.

It corrects error and generates accuracy.

It generates any desired type or degree of controlled surface finish smoothness.

It provides all these advantages under the control of a single process.

Write for Bulletin A. R. 67

Micromatic

HONE CORPORATION

DETROIT, MICHIGAN

Manufacturers of Honing Machine Tools

MICROHONING
is used to finish

Gun Barrels—before and after rifling—diameters .303" to 18" and lengths up to 75 feet • Gun Recuperators and Engine Cylinders • Wrist Pins • Valve Guides • Con Rods • Bearings • Pneumatic and Hydraulic Cylinders—and many other precision parts for ordnance, aircraft, automotive equipment, tanks, machine tools, etc.

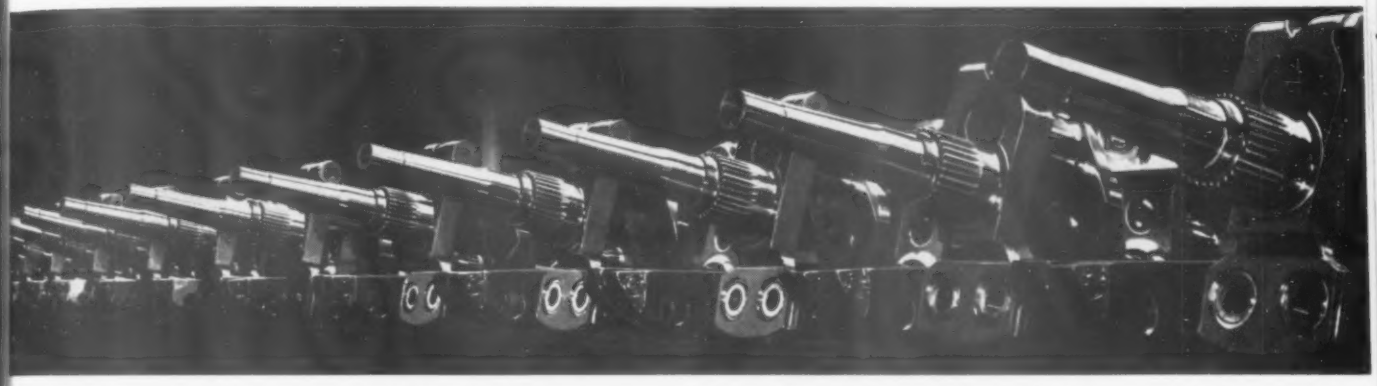
Phone
DETROIT
HOGARTH
7835

Barbers Louis Rosato and Elmer Cioffe exchanged their scissors for power polishers at Lycoming Division of The Aviation Corp., Williamsport, Pa., where they remove burrs from gears for aircraft engines. Without previous experience in precision manufacture, their adeptness has helped them exceed production schedules.

After presenting an "E" award to Packard marine engine employees, Lieut. Commander Alan R. Montgomery led his "Mosquito Fleet" against the Japs. Recently returned, he is shown listening to Packard worker Ira Balthrop explain the operation of the milling machine on which she produces PT boat engine parts.

PRODUCTION PIX

WHAT'S DOING IN THE WORLD OF MASS MANUFACTURING



A photographic study of mass produced precision parts. These two-throw aviation crankshafts for 14-cylinder radial engines await final inspection on the benches of The Ohio Crankshaft Co., Cleveland. They are real masterpieces of precision machining for more than 100 dimensions are held to .001-inch or less. Bearing surfaces have a finished smoothness of four micro-inches. More than 600 machine operations are involved in producing each shaft. Only a small portion of a day's output at the Ohio plant is shown.

Circular saw trims thick armor plate in a plant of the U.S. Steel Corp., which completed two billion dollars of war work in 1942. Using equipment required for repair work but not so utilized 24 hours a day, U.S. Steel has undertaken production machining for outside concerns.

Contrasts in size of products of war and peace exemplified in the operation of this Newton Rotary mill at Hudson Motor Car Co., Detroit. With a rotating table and 8 milling cutters, machine handles 3 aluminum 100-pound cases, roughing and finish milling the face in one rotation. Worker holds sheet metal pan used in a 102-h.p. automobile engine.

Henrietta Poulsen, Mills Novelty Co., Chicago, stoops to conquer. She is examining a portion of this concern's contribution to the industrial scrap drive. Pictured is a portion of 1,000 tons of castings, tools and parts used in peacetime manufacture.

NICKEL AIDS THE AERONAUTICAL INDUSTRY

to KEEP 'EM FLYING!

The design engineers of the aeronautical industry have repeatedly met demands for improved aircraft to serve on world-wide fighting fronts. At the same time the industry has been able to turn out huge quantities of highly complex precision mechanisms on a mass-production basis.

Since the pioneer days of the aviation industry, it has made extensive use of materials containing Nickel for engine and fuselage parts. In these applications the industry's engineers have developed to the fullest extent the useful and unique properties contributed by Nickel to the materials commonly used in aircraft construction.

The continued widespread use of Nickel reflects confidence based on innumerable satisfactory performance records.

On all fronts, pilots and maintenance crews are learning what metallurgists long have known. Properly used, a little Nickel goes a long way toward assuring the dependable performance of aircraft. From valves to drive gears, and from crankshafts to manifolds, modern aircraft perform more dependably because of the added strength, toughness and resistance to corrosion Nickel imparts to other metals.

The technical staff of International Nickel has been privileged to cooperate with the aeronautical engineers who have accomplished so much toward the improvement of aircraft. These engineers and metallurgists offer counsel and data to all who desire assistance in the selection, fabrication and heat treatment of ferrous and non-ferrous metals.

★ **Nickel** ★

Send for lists of available publications. Address your inquiries to Technical Library Service

THE INTERNATIONAL NICKEL COMPANY, INC., *67 Wall St., New York, N.Y.*

THE OLD AND THE NEW TEAM UP TO Speed Drilling!

Thor "ARMORED IN PLASTIC" 1/4" PORTABLE ELECTRIC DRILL

U14K weighs only 3-1/4 pounds, measures only 8-3/16 inches overall. Speeds: 2500, 3750, and 5000 RPM.

With its unique plastic construction, this Thor U14K 1/4-inch portable electric drill is as *new* as tomorrow. Its features of lighter weight, more power per pound and new handling ease provide performance that meets the stiff demands of today's high speed, heavy duty production! And, beneath the plastic armor is the time-proven reliability of Thor construction: the Thor Hevi-Duty motor with its great reserve of power, high torque and remarkable stamina. For every kind of heavy duty, 1/4-inch drilling, this teaming up of the old and the new gives unparalleled results. The Thor "Armored in Plastic" drill is available now to war industries. Write for circular giving full details.

ARMY E NAVY
THOR'S 50th YEAR

Thor *Portable Pneumatic and Electric Tools*

INDEPENDENT PNEUMATIC TOOL COMPANY

600 W. JACKSON BOULEVARD, CHICAGO, ILL.
Branches in Principal Cities

Here's help to Avoid Delays in Production

"TROUBLE SHOOTING" Common Causes of Premature Tool Failure

Today, more than ever before, sound knowledge of "trouble shooting" is one of the essential requirements for getting the most out of your tool making facilities. Under all-out production, every care must be taken to get tools that will not fail prematurely and cause waste of skilled tool making time and interruptions in schedules. Discussed below are a few tips on "trouble shooting" that may be of help in your tool room.

Hardening Cracks—If a tool cracks in hardening, and there is nothing suspicious about the steel or the design, look at the nature of the crack. If the crack penetrates deeply—and does not parallel the length of the original bar—or if the crack shatters the piece, it may be due to one of two causes—too high a hardening heat, or placing a hard tool in a hot furnace.

In connection with this last cause, sometimes a tool does not come from the hardening just as the hardener wants it. He decides to reharden the job and throws it back into a hot furnace. This is a terrible strain on the hard tool and is likely to cause a shattered type of cracking. Since these tools cracked while still in the hardening furnace, the faces of the fracture will contain furnace scale. This definitely indicates that the tool either cracked on the first hardening—or cracked when placed in the furnace for the second hardening. Figure 1 shows the pieces of a tool that cracked in the furnace when an attempt was made to reharden it.

FIG. 1

Soft Spots—After a tool has failed, the trouble can sometimes be traced to accidental soft spots that occurred in the *wrong place*. This is the time to investigate them and take steps to either eliminate them—or to chase them back where they will do no harm.

A prolific cause for "thumb nail" checks in chipping chisels (Fig. 2) is a soft spot occurring on the bit a short distance back from the cutting edge. The crack encloses the soft spot. The cure for this trouble is to switch to a brine quench, whereupon the soft spot will disappear—and with it, the thumb nail check.

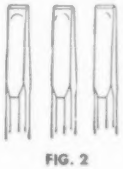


FIG. 2

Spalling—Hardening cracks that might be described as "spalling" or shelling off of corners and edges, are generally due to too low a hardening heat or to non-uniform hardening heat.

The first cause can usually be distinguished from the second by the fact that there are likely to be soft areas on the underheated portions of the tool. A tool that has been non-uniformly heated may come out hard all over or it may contain soft spots. Fig. 3 illustrates a carbon steel reamer that was hardened from a lead pot and the extreme end spalled off in quenching. This tool was not in the lead long enough for the entire tool to become uniformly heated and only the end actually got through the critical far enough to properly harden. In order to demonstrate the lack of hardness on the body of the reamer, it was sawed part way with a hack saw and then broken the rest of the way. The *spalled end*, the *"bald-headed fracture,"* and the *soft body*—all point to non-uniform underheating.

FIG. 3

FIG. 4

Figure 4 is another example of "spalled" fracture from non-uniform heating. This is an oil-hardening tool steel. One corner has spalled off and the other has cracked. While the holes appear to have played a part in the failure, they are not the prime cause. This tool was soft on the flat faces which had not been hot enough, and was file hard on the spalled corners—a clear case of non-uniform underheating.

These tips on "trouble shooting" were taken from Chapter 18 of "Tool Steel Simplified". They are only a small part of the usable information contained in one chapter of the book. Other chapters discuss every phase of tool making—heat treating, quenching, furnace atmospheres, testing, etc. Put all this helpful information to work for you—right in your tool room. Order copies for the tool room men you want to train, for those you want to up-grade to better jobs.

THE CARPENTER STEEL COMPANY, 122 BERN STREET, READING, PENNSYLVANIA

"TOOL STEEL SIMPLIFIED"

315 pages **105 illustrations**

Available at cost in the U.S.A.—$1.00 a copy ($3.50 elsewhere).

More than 35,500 copies of "Tool Steel Simplified" are now being used in plants like yours to train new men, to "up-grade" older hands, save time, "trouble shoot"—get faster production.

Carpenter MATCHED TOOL STEELS

More production per worker!

Foot Control Leaves Both Hands Free To Work!

WANT more production? Follow the example of leading war plants — put *Speedy Air Vises* to work! This foot-controlled, pneumatic vise leaves operator's both hands free for safe, fast insertion and removal of work. You'll find it cuts time, labor and costs, reduces fatigue. Sturdy, compact, precision-built . . . so low in price it can be economically used on every drillpress, miller, filer and assembly line. Prompt delivery. Ask your distributor or write for details.

Features: *Vise opens and closes instantly . . . Remains open or closed without constant foot pressure . . . exerts grip of 15 times air-line pressure . . . Measures 12 x 6½ x 6 in. . . . Jaw width 3 in. . . . Jaw depth 2 in. . . . Maximum opening 3 in. . . . Maximum travel ½ in. Attaches to air line or individual compressor.*

SPEEDY AIR VISE
complete with Foot Control Valve, Air Hose and Fittings . . **$24**

W. R. BROWN CORP.

5722 ARMITAGE AVE., CHICAGO, ILL.

AMERICA'S MOST TALKED-ABOUT VISE . . . AT A PRICE!

The "Sterling" mark on reconditioned cutting tools.

We etch it on every piece, and we stand behind it.

NATIONAL TOOL SALVAGE CO.
6511 Epworth Blvd.
Detroit, Michigan
(Note new address)

ATTENTION

TOOL & DIE MAKERS
SHEET METAL MEN
PATTERN MAKERS
MACHINISTS, ETC.

Speeds layout time on brass, aluminum, copper, tin, stainless steel. Won't chip, crack, or flake off. Comes in handy 8 oz. bench type brush-in cans. Also pts., qts., gals.

Send for Your FREE SAMPLE Today!

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228-T North LaSalle St.
Chicago, Ill.

Thanks to the

SUNNEN PRECISION HONING MACHINE

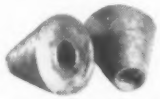
GIRLS IN 'TEENS

are handling jobs in "tenths"!

Aluminum Aircraft Link "produces high finish without bell-mouthing."

Inner Bearing Ring "Accurately removes last 'tenth' of stock."

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.



Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."

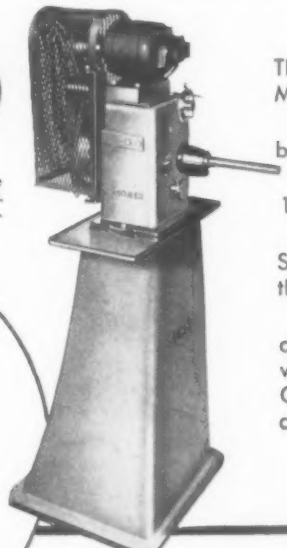
Aviation Hydraulic Cylinder made of Aluminum-Alloy. Improves the quality of the bearing surface. An extremely smooth surface-finish is secured.

Aircraft Valve Tappet Roller. 4-Micro finish.

and what's more remarkable, they can be trained for such accurate work in a few hours.

That's only one reason manufacturers of combat equipment and munitions have adopted the SUNNEN Precision Honing Machine.

The guaranteed accuracy (.0001") and super-smooth finish (2 to 3 micro inches) assure fewer rejects and interchangeability of parts. These advantages not only speed production, but prevent waste of vital war materials.



Low in Cost—Economical to Operate

The basic price of the Sunnen Precision Honing Machine is only $195! And it's economical to operate.

No jigs or fixtures—work is held in hands. Relieves big internal grinders for other jobs.

Wide range—handles any internal diameter from .185" to 2.400".

Protect your previous operations by using the Sunnen method for that most important operation—the last one.

It's easy to find out just what Sunnen equipment can do for you on your job—one of our engineers will be glad to call and help you solve your problems. Or—if you prefer—write for free bulletin giving complete information.

The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.

SUNNEN

SUNNEN PRODUCTS COMPANY, 7932 Manchester Ave., St. Louis, Mo.

Canadian Factory: Chatham, Ontario

How Metal Shrinking Eliminates Bearing Spoilage

...with this 120° Below Zero Cold!

NO POUNDING OF BEARINGS INTO PLACE . . . WITH *Expansion-Fit* ASSEMBLY

Now it is possible with Deepfreeze metal chilling equipment to eliminate the spoilage of expensive bearings caused by unnecessary pounding while assembling. Shrinking of metal at −100° F. to −120° F. with Deepfreeze equipment has made it possible to assemble sleeve bearings, and ball or roller races otherwise requiring a press fit, by merely slipping them into position after chilling. This expansion-fit application usually involves the chilling of the inserted part only, although some practices call for heating the female part slightly and chilling the mating section. In most cases it is possible to insert the male part by hand with a tight fit resulting as soon as the part has returned to room temperature.

ANOTHER MONEY-SAVING DEEPFREEZE APPLICATION

Tapered Roller Bearing-Race Assembly Time Cut to One-half Minute

This manufacturer uses a Deepfreeze Industrial Chilling Machine to shrink steel tapered roller bearing races for insertion in a casting. Time was cut to ½ minute per piece in contrast to former method of using dry ice and kerosene requiring ½ hour to cool kerosene. Deepfreeze eliminated the inconvenience of obtaining the dry ice and the use of kerosene which caused a slush.

SAVINGS

Dry ice method was costly. Used 50 pounds every 3 days with considerable waste. Deepfreeze eliminated cost of dry ice, kerosene, and the cost of delays waiting for delivery.

DATA AND PART INFORMATION

PARTS—Tapered Roller Bearing Races.
MATERIAL—Steel.
SIZE—Bearing Cups 4¼" diameter.
OPERATION—Permanent Expansion-Fit Assembly.
AMOUNT OF SHRINK—(Male Part) .003" in a Deepfreeze Chilling Machine.
TIME—½ minute each.

4 Other Ways DEEPFREEZE CAN HELP YOU:

- **1—TREATMENT OF TOOL STEEL**—Metal chilling at −100° F. to −120° F. can be used for the "conditioning" of steel to produce combinations of hardness, strength, and ductility unobtainable by ordinary hardening and tempering.
- **2—SEASONING GAUGES, ETC.**—Metal chilling is used by tool and gauge manufacturers to insure dimensional stabilizing of the steel to prevent excessive expansion of the parts due to minor variations in temperature.
- **3—CHILLING ALUMINUM RIVETS**—Storing and chilling annealed aluminum alloy rivets retard age hardening. Rivets stored at −50° F. remain soft enough for driving for two or more weeks.
- **4—TESTING OF METAL AND OTHER MATERIALS**—Deepfreeze sub-zero temperatures are used for the testing of aircraft instruments and materials to study the reactions of vital equipment to stratosphere flying.

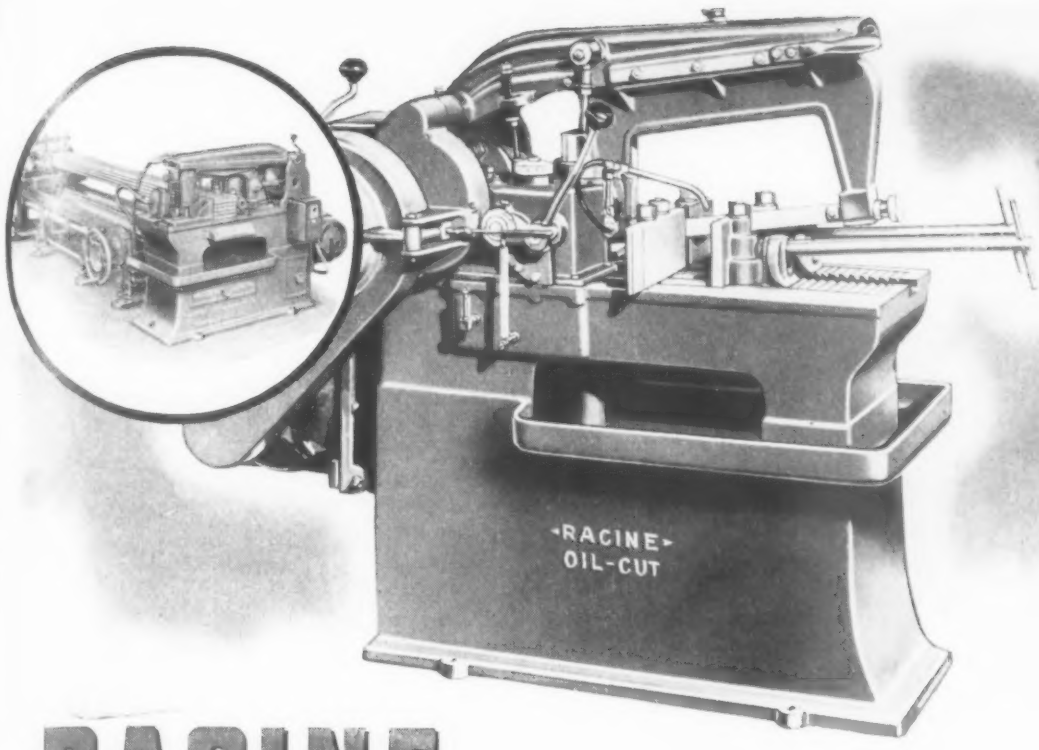
FREE BULLETIN describing Deepfreeze Units with complete details and specifications, and listing other uses. Send for copy today.

WHAT'S YOUR METAL-CHILLING PROBLEM?

Deepfreeze engineers are available to assist you with your metal chilling prob-

Deepfreeze
DIVISION

MOTOR PRODUCTS CORPORATION
2311 DAVIS ST., NORTH CHICAGO, ILLINOIS



RACINE METAL CUTTING MACHINES

THE PRODUCTION SAWS OF MODERN INDUSTRY

Operation No. 1 in Your Metal Cutting Department

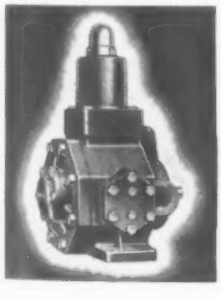
Start your production line with Racine accuracy—in the cutting of bars, tubing, and structural shapes.

This dependable accuracy is the result of Racine's rigid construction features and the Racine type of self-compensating, flexible hydraulic feed.

Racine was first to successfully apply the smooth oil-cushioned operation of hydraulic action to a power hack saw machine. Simple automatic hydraulic control of feed and pressure make Racine preferred by the inexperienced operators as well as the experienced operators in today's high speed war production. A single lever controls feed, clutch, transverse and neutral operating action—all from one operating position.

And Racine's extra heavy pivot shaft and wide pivot bearing in saw guide arm, prevents cocking or binding strain—greatly lengthening the life of the machine.

Investigate Racine's wide range of sizes—capacities 6″ x 6″ to 20″ x 20″. Racine Automatic Hydraulic Stock Feed Machines—that bring new labor-saving features to any metal cutting operation—are also available.

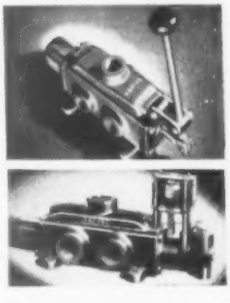


RACINE *Variable Volume*
HYDRAULIC PUMPS
A Modern Source of Hydraulic Force

A new "high" in vibrationless action is made possible by Racine Oil Hydraulic Pumps for any operation of feeding, bending, forming, holding or molding. Only Racine has the "Vane Type" Variable Volume feature—no relief valves are required. It pumps only the required amount of oil needed to do the job. Pressures from 50 to 1000 lbs. per sq. in. at 0 to 30 gal. per min.

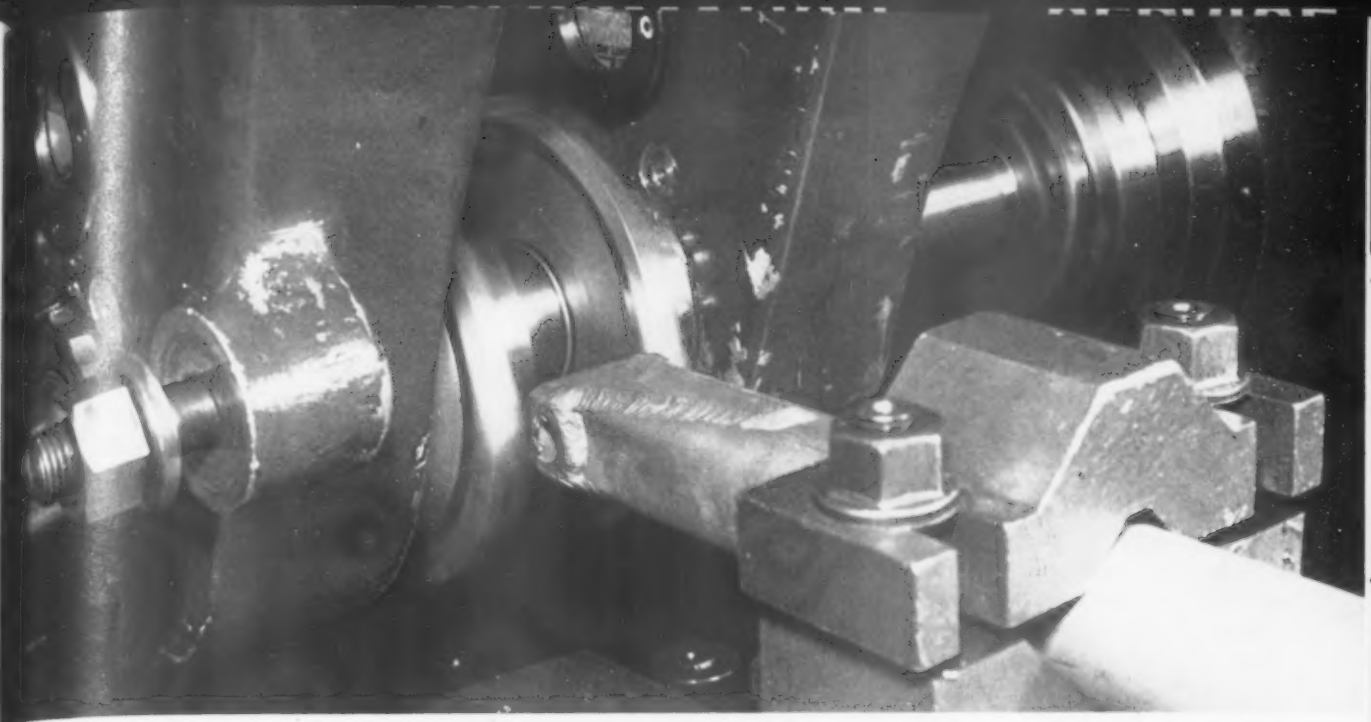
RACINE
OIL HYDRAULIC VALVES

The exclusive Racine "Sleeve Type" and "Balanced Piston" construction provides larger bearing and sealing area. Piston cannot sag. Shock is reduced to a minimum in hydraulic circuit, because of Racine's unique "porting" design. These four-way valves are available with stem, lever, roller, latch, foot treadle and solenoid operating devices. Made in ⅜″ to 1½″ standard pipe sizes. "Custom-made" porting arrangements can be supplied to suit your specific requirements.



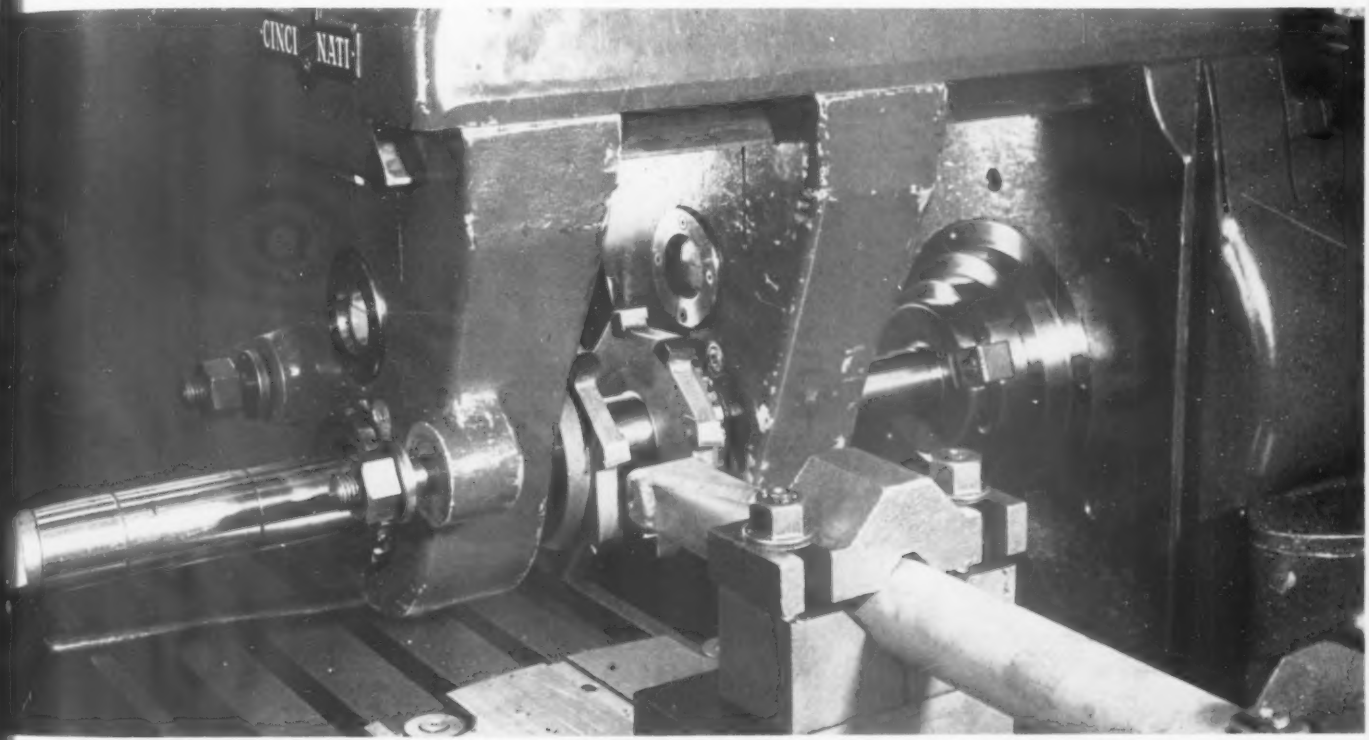
Racine's Hydraulic specialists will be glad to help you with your hydraulic application problem—with no obligation. Immediate attention will be given your request for complete information and prices on Racine Saws or Hydraulic Pumps and Valves. Address Dept. TE-S

RACINE TOOL and MACHINE COMPANY
STANDARD FOR QUALITY AND PRECISION
RACINE, WISCONSIN • U. S. A.



425 R.P.M. 19¾" FEED PER MINUTE

Plunge-cut, milling 4130 HEAT-TREATED struts, at the VEGA AIRCRAFT plant, Burbank, California.



Milling alloy steels, heat-treated to 44 ROCKWELL C, is an exacting job, but it is being done satisfactorily.

CAST IRON, MEEHANITE, and NONFERROUS METALS are less exacting, but the satisfaction resulting from the milling of these metals with Grayson Cemented Carbide cutters is even greater, because of the amazing, increased speeds and feeds, and the number of parts per grinding of cutter.

U.S. and British Patents Pending

Grayson Manufacturing Company

RAILROAD AVENUE, MONROVIA, CALIFORNIA

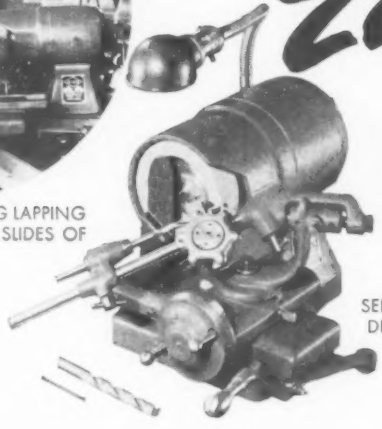
TALCOTT BUILDING, ROCKFORD, ILLINOIS

Simplified Assembly

JIMMY LOU SMITH, VALERIE BILL, LIDIE CROSBY, ALMA GUERARD ASSEMBLING NO. 1-G DRILL GRINDERS IN THE SELLERS FACTORY

Ease of Operation

ISABELLE DOWLING LAPPING AND ADJUSTING SLIDES OF 1-G GRINDER.



SELLERS NO. 1-G DRILL GRINDER

SIMPLICITY ITSELF!

1. INSERT DRILL

2. A QUARTER-TURN OF THE RIGHT HAND CHUCKS IT SECURELY

3. MOVE TO GRINDER POSITION

4. GRIND THE SCIENTIFICALLY CORRECT SELLERS POINT

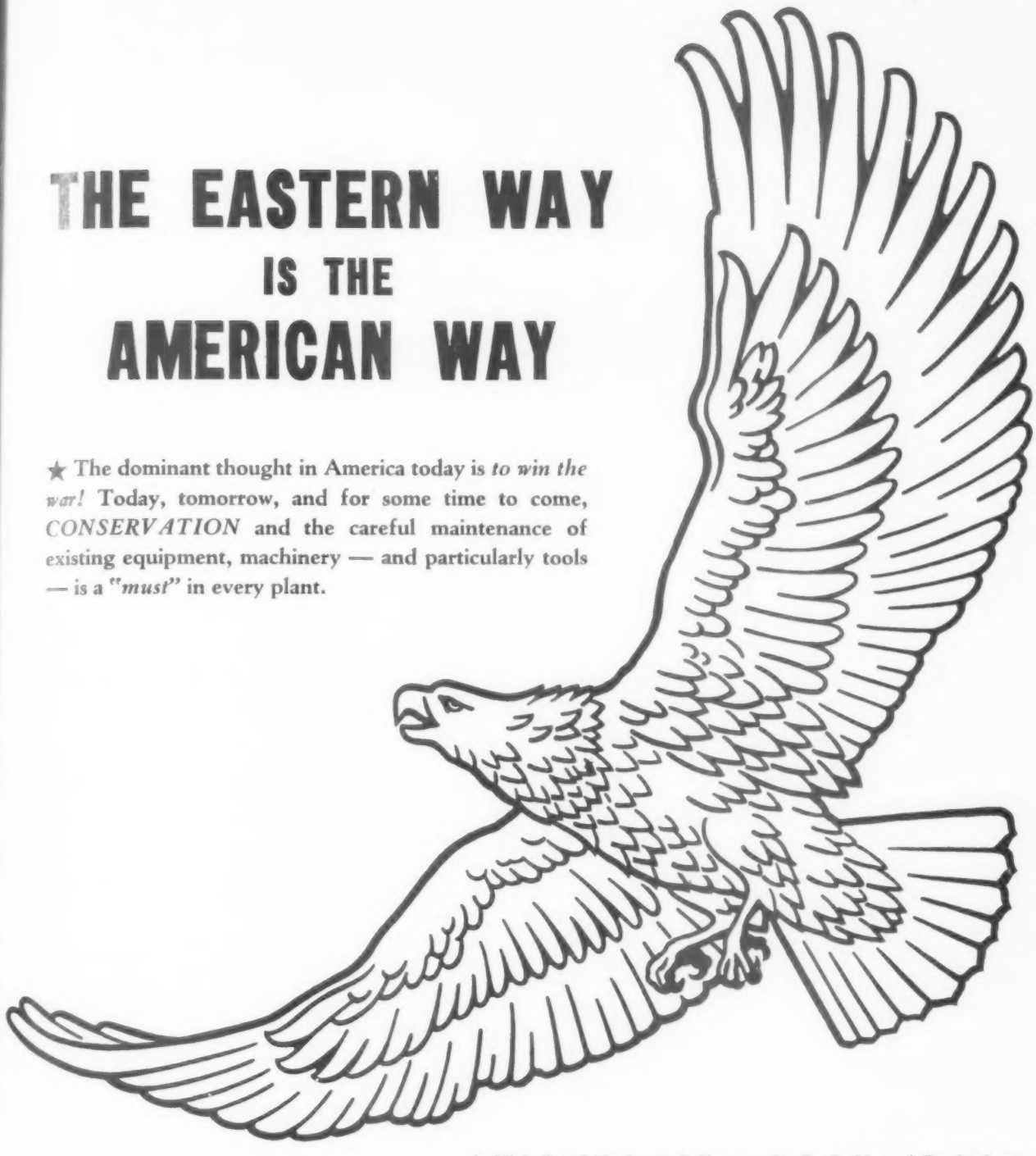
★ **The employment of girls to release manpower for our growing Armed Forces is a new experience for the 94-year-old firm of Wm. Sellers & Co. Only the vital need of the hour could have brought about such a radical change. Yet one of the things that contributed was the very simplicity of Sellers design. That which has been responsible for the precision and ease of operation of Sellers Drill Grinders is making it possible for these young women to assemble these machines with the same accuracy and reliability as the men they have patriotically released for War Service. This same simplicity, combined with precision and ease of operation, is making drill-grinding by girls and other relatively unskilled operators a speedy, accurate job in thousands of factories everywhere.**

WILLIAM SELLERS & CO., INC., Philadelphia, Pa.

Sellers

THE EASTERN WAY
IS THE
AMERICAN WAY

★ The dominant thought in America today is *to win the war!* Today, tomorrow, and for some time to come, *CONSERVATION* and the careful maintenance of existing equipment, machinery — and particularly tools — is a "*must*" in every plant.



MORE THAN
30 YEARS' EXPERIENCE
IN TOOL RECONDITIONING

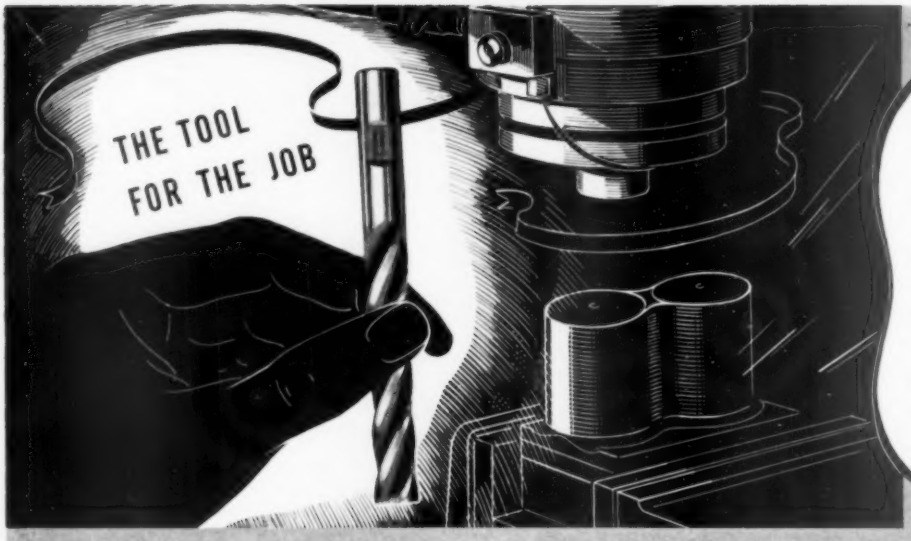
★ High Speed Tools are bullets on the Battle Line of Production. The demand for reconditioning these tools has been so great — and the need for production speed has been so intense — in tune with the war effort, that this fact affords us an opportunity to say that the *Eastern Way is the American Way* of reducing costs and achieving more efficient production.

A COMPLETE RECONDITIONING SERVICE FOR TOOLS

NEW MILLING CUTTERS FROM OUR STOCK OR YOUR OWN STANDARD CUTTERS
CAN BE QUICKLY CONVERTED TO SPECIAL CUTTERS

EASTERN CUTTER CORPORATION 30-32 Littleton Ave., Newark, N. J.

Chrome Plant **MASTER CHROME SERVICE** INC., 5709 Herman Ave., N. W., Cleveland, Ohio



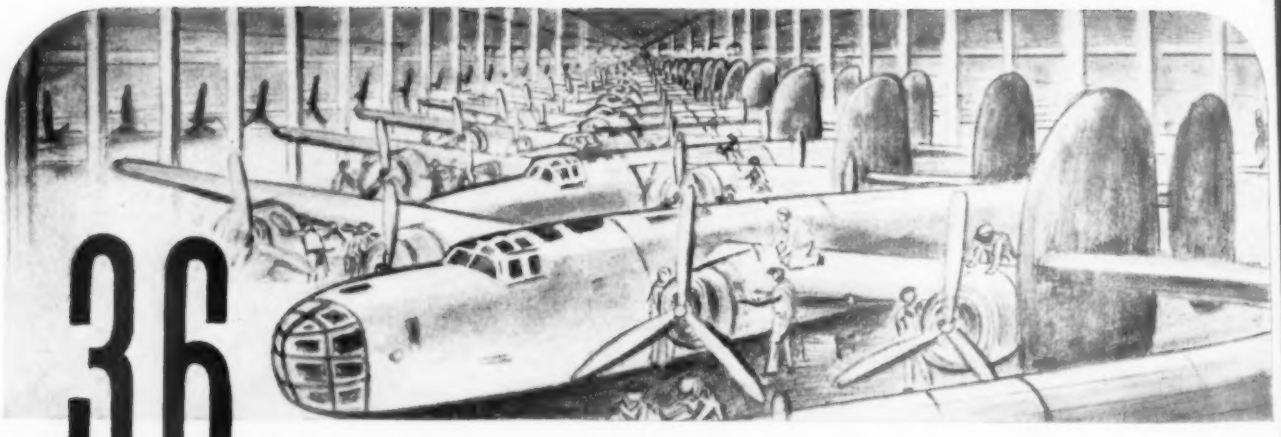
END MILLS AVAILABLE FROM STOCK

Some sizes and types of Putnam End Mills can be supplied immediately from stock. Your Putnam sales representative can tell you what are now available.

PUTNAM END MILLS FOR FINISH MILLING

Exceptional finish from the milling operation alone can be obtained by using Putnam Hi-Speed End Mills. These tools are of a design and quality that make them especially adaptable to operations involving high spindle speeds, precision movements, rotary head motion, or other difficult conditions. No matter what kind of a milling job you have, a Putnam Hi-Speed End Mill is always "the tool for the job."

PUTNAM TOOL COMPANY
2985 Charlevoix Avenue • Detroit, Michigan



36 THOUSAND PARTS *and Every One* RIGHT!

BEFORE they take to the air, before final assembly, before finishing — yes, right from the start the 36 thousand machined parts in a plane must be right. Each part must take dozens of tests. The basis for most of these tests for accuracy is the surface plate. Lombard Surface Plates, heat treated and hand scraped for permanent accuracy, have the famous three point suspension essential to absolute stability and form the perfect link in the complete inspection chain.

Prompt delivery can be had according to grades and tolurances in any of several sizes from 14"x 18" to 48"x 96". Also available is the Lombard 'Prop-Test' Stand.

LOMBARD GOVERNOR CORPORATION
100 MAIN ST., ASHLAND, MASS., U. S. A.

Here's another 10 seconds the Axis won't get!

You don't stop or slow down the machine to change tools with Apex Quick Change Drill Chucks. And a few seconds saved repeatedly, give you extra *productive* man hours per week per machine.

Green hands catch on quick to these simple, rugged chucks. A flip of the wrist changes drills, taps, reamers, counterbores, etc.—on drill presses, radials, lathes, hand screws, electric and air tools. Plunger design prevents dirt from clogging hole. Ball nose plungers guaranteed not to fall out during life of chuck. Morse taper shanks are standard; others to your specifications. Write for the complete catalog of Apex production tools, No. 14.

APEX

THE APEX MACHINE & TOOL CO., DAYTON, OHIO

Manufacturers of Safety Friction Tapping Chucks, Quick Change and Positive Drive Drill Chucks, Vertical Float Tapping Chucks, Parallel Floating Tool Holders, Power Bits for Phillips, Slotted Head and Clutch Head Screws, Hand Drivers for Phillips and Clutch Head Screws, Aircraft Universal Joints, Plain and Universal Joint Socket Wrenches.

A Check-off of Your Requirements for FORM RELIEVED MILLING CUTTERS

It is only reasonable that, when you place orders for form relieved milling cutters, you should expect:

- ✓ Strict adherence to the tool design, dimensions and tolerances which appear on your prints.
- ✓ The use of high speed steels that will guarantee tools of long life and lasting accuracy.
- ✓ Reasonably prompt delivery.
- ✓ Intelligent cooperation of a manufacturer who is thoroughly experienced in producing cutters of this type and who, when it seems advisable, can offer suggestions and recommendations to improve the performance of the tools for your particular jobs.

Morse Tool Company has manufactured thousands of types of form relieved milling cutters over the past 22 years. With the experience, ability and facilities available today, it is one concern you can certainly depend on to complete to the last detail the "check-off" of your list of requirements.

Morse Tool Company 116 E. GOLDENGATE ST. DETROIT • MICHIGAN

The Inspection Usefulness of at Least

1900 ORDINARY GAGES

in These

LINCOLN PARK CARBOLOY GAGES

Pictured above are some of the types of gages manufactured by Lincoln Park and in which Carboloy cemented-carbides are used. To get the equivalent in wear-resistance and useful, accurate life in steel gages, at least fifty times the number of gages illustrated would be required.

The lasting accuracy of a Lincoln Park Carboloy gage is obvious because of its wear-resistant qualities. What is more important is that when the gage is ordered it can be specified extremely close to required limits—a guarantee of the greatest accuracy and economy in the inspection of hundreds of thousands of parts with one single gage. This is made possible since wear allowance can be reduced . . . automatically increasing the manufacturing tolerance.

Carboloy gages in War Production have helped to save steel . . . release gage manufacturing capacity . . . and provide the original and lasting accuracy that has eliminated rejections of important and expensive parts which should be acceptable in final inspection. Most of these gages have been produced by the Lincoln Park organization . . . pioneers in its use and over a number of years the largest users of Carboloy in the manufacture of gages . . . an outfit to depend on for the finest wear-resistant gages of the future.

ARMY (E) NAVY

LINCOLN PARK TOOL and GAGE CO.

LINCOLN PARK, MICHIGAN

NOW

there's another good reason for using . . .

Ettco-Emrick

KEYLESS DRILL CHUCKS

WRITE FOR BULLETIN No. 6

which gives full details of the 5 sizes for No. 0 to ⅜" drills.

•

Ettco - Emrick Keyless Drill Chucks are also available for portable drills.

Now, with more and more women operators, that keyless feature is a bigger advantage than ever because it eliminates the need for strength in setting up drills.

The operator merely turns the body by hand only enough to hold the drill. Drilling action does the tightening — and the heavier the load the tighter the hold — which means drills just can't slip, so there's never any time lost to retighten. Yet, the chuck can always be just as easily loosened by hand. The design takes care of that.

But whether you have men or women operators, your drilling is bound to go faster with Ettco-Emrick KEYLESS Chucks because they eliminate the non-productive key tightening operation with its continued waste of time and energy.

You are also assured of long, hard service from these chucks because they are designed and built to the highest standards of precision tool quality.

ETTCO TOOL CO.

586 Johnson Ave., Brooklyn, N. Y.

Detroit • Chicago

The Famous Ettco-Emrick DRILL CHUCKS • TAP HOLDING CHUCKS
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship

"Safe-Hed" STEEL STAMPS

IMMEDIATE SHIPMENT FROM STOCK
ALLOY TOOL STEEL
ALL SIZES
MADE FOR 90% OF MARKING NEEDS

Write for Cat. 146-A!

JAS. H. MATTHEWS & CO.

3945 Forbes Street Pittsburgh, Pa.
Branch Plants
New York, Boston, Chicago, Philadelphia, Newark, Syracuse
District Sales Offices
Cleveland Detroit Hartford Birmingham

DOUGLAS PRECISION MILLER

PROMPT DELIVERY

DOUGLAS MACHINERY CO., INC.

150 BROADWAY · · NEW YORK, N. Y.

FREE INFORMATION and SERVICE

Request the information and service you desire and keep your library up-to-date . . .

THREE FREE SERVICES without obligation

For your convenience these three business reply cards enable you to request quickly

1: New catalogs — bulletins listed in this issue.

2: Additional information or bulletins relative to new equipment — new materials or new processes.

3: When answering advertisements, specific information on problems or company representative's call.

HOW TO ORDER

Simply fill out the card, indicating the information or service you desire, and mail.

Be sure to write, in the square, the identifying number of the catalogs or bulletins covering new products described.

In answering an advertisement, include the name of the advertiser and indicate by a cross if literature is desired or if company representative should call. No stamp is required.

1

USE THIS CARD

for requesting new catalogs and bulletins listed in this issue.

2

USE THIS CARD

for requesting additional information or bulletins about new equipment, materials, processes, etc.

3

USE THIS CARD

when answering advertisements, to obtain specific information on problems, or when you desire a company representative to call.

Write in square, number of item describing one catalog wanted ➔ ☐

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER, MAY 1943

Write in square, number of item describing one catalog wanted ➔ ☐

NAME

COMPANY

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THE TOOL ENGINEER, MAY 1943

Write in square, number of item describing one catalog wanted ➔ ☐

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Write in square, number of item describing one catalog wanted ➔ ☐

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THE TOOL ENGINEER, MAY 1943

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NAME OF ADVERTISER

☐ Literature ☐ Have Representative Call

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PAGE NO.

NAME OF ADVERTISER

☐ Literature ☐ Have Representative Call

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COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER, MAY 1943

USE THESE FREE REPLY CARDS

They are provided for your convenience in requesting information and service . . . . .

FIRST CLASS
PERMIT No. 6691
(Sec. 510, P. L. & R.)
DETROIT, MICH.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

2c.-POSTAGE WILL BE PAID BY—

THE TOOL ENGINEER
THE BRAMSON PUBLISHING COMPANY
2842 W. GRAND BLVD.
DETROIT, MICHIGAN

1

Request for:
NEW CATALOGS
BULLETINS
BOOKLETS

FIRST CLASS
PERMIT No. 6691
(Sec. 510, P. L. & R.)
DETROIT, MICH.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

2c.-POSTAGE WILL BE PAID BY—

THE TOOL ENGINEER
THE BRAMSON PUBLISHING COMPANY
2842 W. GRAND BLVD.
DETROIT, MICHIGAN

2

Request for additional information and catalogs covering
NEW EQUIPMENT
MATERIALS
PROCESSES

FIRST CLASS
PERMIT No. 6691
(Sec. 510, P. L. & R.)
DETROIT, MICH.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

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THE BRAMSON PUBLISHING COMPANY
2842 W. GRAND BLVD.
DETROIT, MICHIGAN

3

ANSWERING
ADVERTISEMENTS
Requesting:
LITERATURE
REPRESENTATIVE
TO CALL

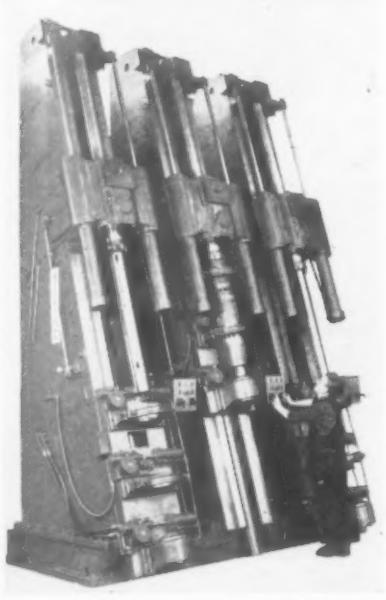
NEW EQUIPMENT, Materials, Processing

T.M. REG. U.S. PAT. OFF.

SPECIAL, HYDRAULIC FEED BORING MACHINE. (K36)

The accompanying illustration shows three MR114 boring machines, manufactured by the Moline Tool Company, fastened together to form one three-column unit. However, each machine is operated independently of the others.

This type of machine was developed to meet a demand by a builder of large diesel engines for heavy, rigid and accurate equipment for boring cylinder sleeves and facing the ends of the sleeves.



Three Column Boring Machine Unit
Each machine operates separately.

The boring spindle thrust bearing assembly and the fixture on each column move on inclined ways and the boring tools are piloted above and below the work. Each column has two motors. One motor drives the spindle while the other drives the hydraulic feed unit. Two spindle rotational speeds are immediately available by means of a lever.

A combination of push buttons and selector switches control all functions of the machine. Electrical interlocking is said to prevent possible errors in operating sequence. The manufacturer states that automatic lubrication of the ways and spindle drive gears assures freedom from troubles caused by oversight where manual lubrication is used.

On each column, the fixture is set in the extreme "down" position for loading and unloading. It is set in the extreme "up" position for boring and there is an "intermediate" position for the facing operations which permits the operator to watch the action of the facing tools.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

WIRE REINFORCED V-BELTS (K37)

The production of wire reinforced V-belts was recently announced by The B. F. Goodrich Company. Said to be designed for rigorous service, the manufacturer states that advantages of this new V-belt include greater horsepower capacity, increased tensile strength and low stretch.

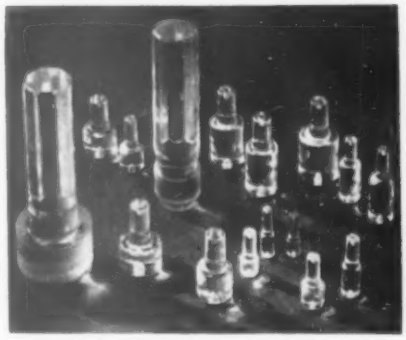
Two types are being built. One is of a cable cord construction and the other is of a grommet construction which incorporates a wire cord placed in the center of a cotton or rayon grommet. To find out whether or not a wire belt is practical for a specific machine, the company states that it will be necessary for them to study the full engineering details of the equipment on which the belt may be used.

EXTRA LARGE SURFACE PLATE (K38)

This new surface plate is claimed to be the largest, in point of depth and weight, ever made to carry exceedingly heavy loads without deflection. It was designed and manufactured by Machine Products Corporation of Detroit to meet the heavy load requirements of one of the leading aircraft motor manufacturers.

The surface plate measures 4 by 6 feet and has a depth of 20 inches. Its total weight is said to exceed 2 tons. Made of Meehanite iron, it is thoroughly heat treated and accurately scraped to meet precision requirements, according to the manufacturer.

It is mounted on specially designed pedestal type bases and is provided with three adjustable bearings supplemented by additional adjusting screws for leveling purposes. Thus supported on several points of contact, it is stated that the plate cannot be dislodged by floor vibration or other causes and will remain uniformly level.



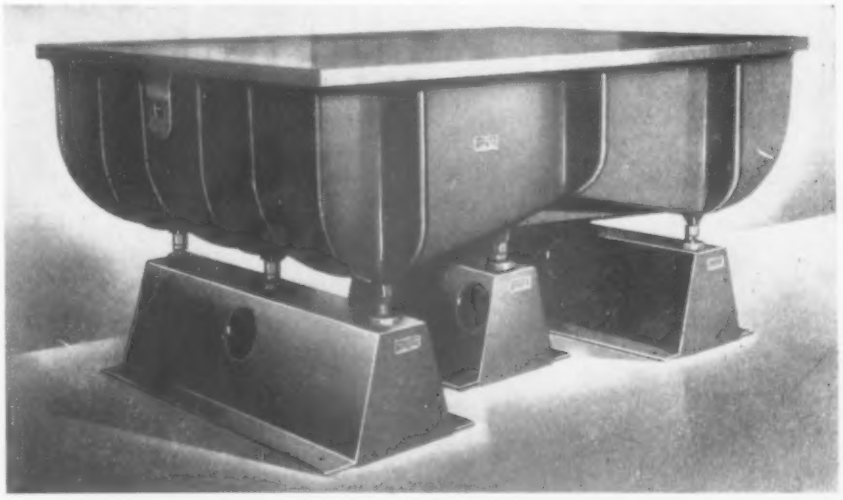
New Line of Turner Glass Gauges
From ⅜ to 2¼ inches diameter.

NEW GLASS GAUGES (K39)

In announcing the production of a line of glass gauges, The Turner Gauge Grinding Company of Ferndale, Michigan states that the glass gauges are made to the same tolerances as steel gauges. These glass plug gauges range from ⅜ to 2¼ inches in diameter. Additional sizes will be available when moulds are completed.

According to the manufacturer, extensive tests have been made with these gauges and advantages have been found such as the fact that they are not subject to corrosion, that they afford visibility in inspection, that scratches and

(Continued on page 166)



Surface Plate Designed and Manufactured by Machine Products Corporation
Said to be the largest in point of depth and weight, made for heavy loads.

slight chipping on glass neither burr glass gauges nor change their gauging functions and that glass gauges when dropped either break or remain dimensionally the same whereas steel gauges may spring or deform.

In the production of these glass gauges, the manufacturer points out that there is a definite saving of critical tool steels and, since glass gauges do not rust, greasing is not necessary for shipment and storage.

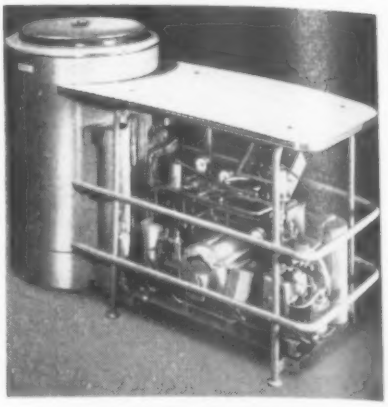
INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

NEW UNIT FOR INDUSTRIAL CHILLING (K40)

Known as Model D-70, the new Deepfreeze 2-stage industrial chilling unit recently announced by the Motor Products Corporation of North Chicago is said to provide a wide range of sub-zero temperatures. According to the manufacturer, it has a maximum capacity of -70 degrees F. and removes 800 B.T.U. per hour at that temperature.

One of the many types of jobs this new unit is doing is the providing of sub-zero cold for the testing of aircraft instruments and parts and for the testing of plastic and rubber. Applications in the aircraft industry also include such work as retarding the aging of alumi-



New Industrial Chilling Unit
Removes 800 B.T.U. per hour.

num rivets, storing annealed aluminum alloy metals and shrink-fit assembly of parts.

The chilling chamber of this unit consists of a double wall cold cylinder which entirely surrounds the walls of the chilling compartment. Interior diameter of the cylinder is 18 inches and its depth is 30 inches. The manufacturer states that this unit gives over 24 square feet of primary freezing surface and has a capacity of 33 gallons. Said to take up very little space, this industrial chilling unit has an overall height of 37 inches, a length of 67 inches and a width of 36 inches.

ABRASIVE BELT BACKSTAND IDLER (K41)

A new floor-type model abrasive belt backstand idler has recently been developed by the Jones Engineering Company of Ellwood City, Pa. It is said to have been especially designed for crowded grinding and polishing de-

Abrasive Belt Backstand Idler
Designed to take less space.

partments and can be easily and quickly connected to any regular grinding or polishing lathe.

The reason that this new idler, called the Model 120, takes less space is said to be the fact that it has a unique vertical arrangement of pulleys as shown in the accompanying illustration.

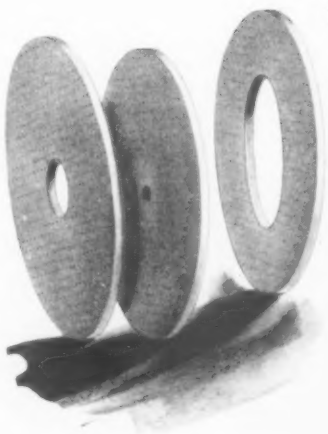
Some of the features of this new idler

(Continued on page 168)

This Merry-go-round has gone to war!

1. It takes a lot of parts to make a Jeep. And this "merry-go-round" has the job of grinding some of those parts (those with flat surfaces)...in a hurry! By rotating a large number of pieces beneath a Carborundum made disc wheel, it surface grinds them in a fraction of the time required by older methods. This process is one which Carborundum helped develop.

2. Surface ground parts for jeeps, tanks and other weapons just couldn't be finished one at a time; production would be hopelessly low. The introduction of disc wheels and the "merry-go-round" surface grinder put surface grinding on a real mass production basis. The method can be used to generate flat surfaces to precision tolerances, on smallest pieces or on massive forgings and castings. It speeds production of many vital war items from valve springs to connecting rods, from piston rings to clutch plates!



3. Careful supervision of grinding operations is vital today to conserve materials and time. The abrasive disc wheel is a "Weapon of Production" and should be properly used for maximum effectiveness. The Carborundum Company, Niagara Falls, N. Y.

CARBORUNDUM
ABRASIVE PRODUCTS

Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company.

mentioned by the manufacturer include conveniently located controls at the front of the machine, adjustable spring belt tightening and positive screw belt aligning. The backstand will take any belt size up to 6 inches wide and is designed for belt speeds up to 10,000 surface feet per minute. It is built so that dust collecting hoods can be installed.

NEW AUTOMATIC CHECKING RECORDER (K42)

Designated as the Model B, a new automatic checking recorder is now being offered by Michigan Tool Company, 7171 East McNichols Road, Detroit. Designed for use with the Michigan Sine-Line lead and involute checkers, the new recorder makes permanent chart records of involute tooth forms and leads.

Moreover, the manufacturer states that once the recorder is installed, it can be applied to a variety of miscellaneous checking operations. It can be utilized to record variations in dimensions of thread forms, to surface checking with parallels and other checking operations wherein a precise record of dimensions is desired.

Synchronous devices are used in the operation of the recorder. One is located in the recorder and another is installed on a bracket in the base of the gear checker or other type of measuring device. Any motion imparted to the checker is multiplied and duplicated in the recorder through the electrical connections between the two units.

There are two methods of attaching the recorder to the measuring device. The chart drive may either be coupled in synchronism with the moving spindle or table of the measuring device, or it may be driven independently by a separate synchronous motor.

The movement of the indicator pen on the chart is magnified in the ratio of one ten-thousandths inch to one-eighth inch.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

New Automatic Checking Recorder
Makes permanent chart records.

COUNTERSINKS AND COUNTERBORES (K43)

Advancement in the design and manufacture of their spiral fluted countersinks and counterbores was recently announced by Schrillo Aero Tool Engineering Company of Los Angeles. The manufacturer states that the design of the spiral permits the countersinks to be sharpened repeatedly without sacrifice of cutting efficiency.

It is claimed that the special spiral design of the cutters results in superior chip clearance. Both the countersinks and the counterbores have hardened and ground shanks that are said to be unaffected by chucks or wear.

ANGLE TO TANGENT RADIUS DRESSER (K44)

In designing this new dresser, the manufacturers, Perfex Gage & Tool Company of Detroit, state that they have deviated from the usual method

(Continued on page 170)

A Vital Message

TO EVERYONE USING MILLING CUTTERS WITH INSERTED BLADES

High speed steel is scarce. It is every shop man's duty to see that the supply on hand be used to the limit, and to see that all scrap is returned to the steel mills.

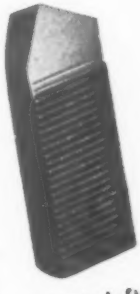
Lovejoy type "A" Milling Cutters were designed to utilize more than half the length of Lovejoy Blades. This is accomplished by Lovejoy's exclusive positive-locking device which holds short blades as rigidly as new blades. Be sure to take advantage of this feature — not only to help your costs and production, but also to help Uncle Sam.

When your Lovejoy Blades have been used to the limit, then order new blades out of our stock. Lovejoy High Speed Steel, Stellite, Rexalloy and Cemented-carbide blades in all standard sizes are ready for immediate shipment.

★

Often worn out Cemented-carbide blades may be salvaged by retipping — ask about this new Lovejoy service.

NEW
A new Lovejoy blade



SAVE
Still plenty of life left

SCRAP
Sell blades like this to Uncle Sam — he needs them

LOVEJOY
TOOL COMPANY, Inc.
SPRINGFIELD, VERMONT, U.S.A.

of dressing from the side of the wheel. This dresser is of the horizontal type and it is said to make possible the dressing of the wheel at the bottom.

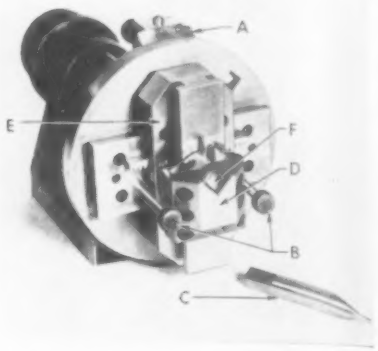
Another advantage claimed of this dresser is the way in which the diamond point is automatically set on center. This is said to be accomplished by the exclusive feature of the diamond mount construction and the way in which the shank of the diamond tool is ground. The accompanying illustration shows the 90 degree vee ground in the dresser's diamond mount block and also the two flats ground on the diamond tool shank. Thus when the diamond shank is placed in position in the 90 degree vee of the mount block, it automatically places the diamond point in perfect center, according to the manufacturer.

With this dresser it is said to be possible to dress a .050 radius to a full half circle without the purchase of additional equipment. By using a gage block set up, a direct reading from the base to the diamond can be obtained. Construction of the dresser also permits the use of a sine bar to insure accuracy of angles.

In the illustration, A is the vernier, B the stop pins, C the dressing diamond, D the radius adjustment, E the tangent slide and F the dressing tool mounting.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

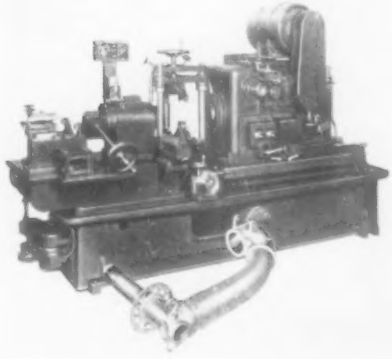


Angle to Tangent Radius Dresser
Dresses wheel at the bottom.

HYDRAULIC BORING AND FACING MACHINE (K45)

This single spindle hydraulic boring and facing machine was designed and built by Snyder Tool & Engineering Company of Detroit. It is said to have met a special problem encountered by an aircraft manufacturer in accurately boring and facing parts that may have a tendency to vary slightly in length.

The machine is equipped with a unit having a heavy-duty worm wheel driven spindle with a selection of eight speeds. Tooling consists of a breach lock spindle adapter and various boring, facing and undercutting tools. A revolving control dog rail, quickly set up for each individual tool, controls the distances which the various tools feed through the work piece. The spindle returns to position following each work cycle.



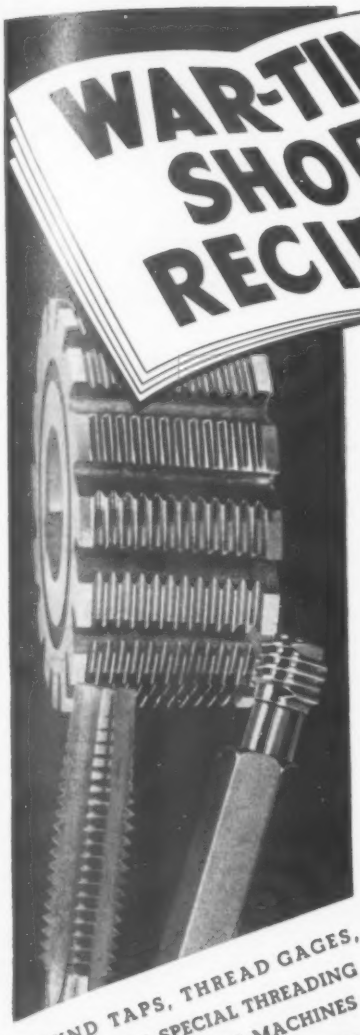
New Boring and Facing Machine
Handles work varying in length.

The part is located and clamped against two ground diameters on a shaft exactly at right angles to the boss that is to be bored. To remedy the fact that the parts vary slightly in length, the manufacturer provided on the work holding fixture a means of indicating the stock variation and compensating for it by moving the solid stops on the spindle unit.

(Continued on page 172)

WAR-TIME SHOP RECIPES

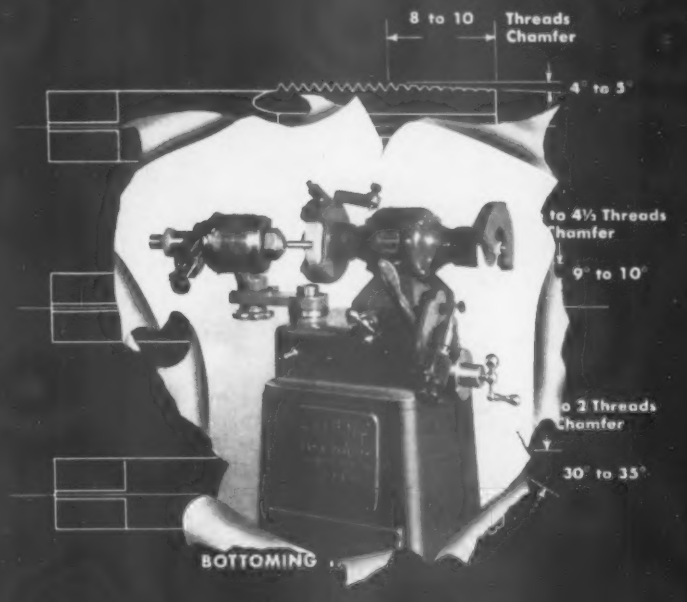
#2 for thread production

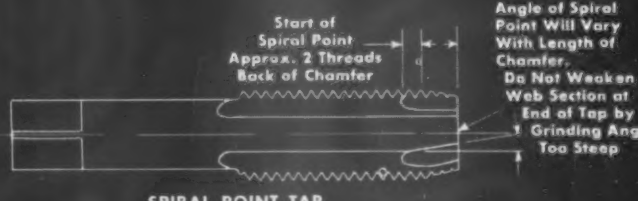


GROUND TAPS, THREAD GAGES, THREAD HOBS & SPECIAL THREADING TOOLS. SPECIAL TAPPING MACHINES

HANG THIS CARD ABOVE YOUR MACHINE

Recommended Angles for Tap Chamfers





SPIRAL POINT TAP

TAKE (1) All your dull or worn taps
(2) "Detroit" Tap reconditioning wall chart, as illustrated
(3) "Detroit" Tap Reconditioner

Then grind taps on the Reconditioner according to instructions on the wall chart and put them back to work — as good as new.

If you don't have a copy of this wall chart, write for one today *on your company letterhead.* Ask for Chart No. RTC.

DETROIT TAP & TOOL CO.

8432 BUTLER STREET, DETROIT, MICHIGAN, U. S. A.

NEW WASHER FOR METAL PARTS (K46)

A new metal parts washer called the "Simplex" was recently announced by The Sturdy-Bilt Equipment Corporation of West Allis, Milwaukee, Wisconsin. Said to be an improved automatic unit, it saves time in the cleaning, washing and preparation of small metal parts, castings and stampings.

Hot or cold solution may be used. The correct solution, as determined by the particular application, in the tank provides a chemical action during the soak and loosens grease, oil, dirt and foreign metal chips. An electric motor operates a lever mechanism which lowers and raises the material tray into and out of the soaking tank. The "swishing" provides a soaking and washing action that is said to remove all foreign matter.

The tank is fully insulated and the cleaning solution can be heated to a temperature of 120 to 130 degrees in a short time by means of steam, electricity or gas, as desired. The washer is furnished in three sizes of 130, 265 and 450 gallon capacities. The manufacturer states that special sizes can be made for special requirements.

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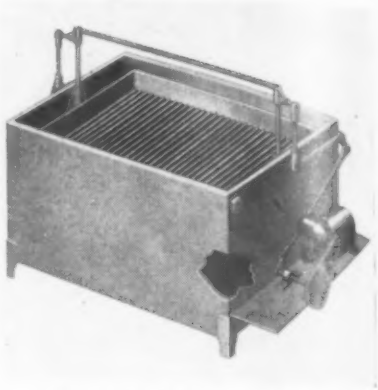


Simplex Metal Parts Washer
Uses Hot or Cold Solution.

CARBIDE TOOL GRINDER (K47)

The 14 inch carbide tool grinder manufactured by The Standard Electrical Tool Company, 2488 River Road, Cincinnati has been re-designed according to a recent announcement. The new construction incorporates a rigid mounting for the work table at each side. The graduated table permits a 5 degree adjustment toward the wheel and a 30 degree angle away from the wheel.

The manufacturer also states that the construction of the machine permits optional use of either wet or dry grinding. The wet grinding attachment is powered by individual motor drive and is controlled by a separate toggle switch.

A 3 hp, 1150 rpm motor furnishes the power for the grinder and it is operated by a magnetic reversing starter and separate three button push button station. The spindle ends are equipped with heavy steel backing plates for mounting of the cup type grinding wheels.

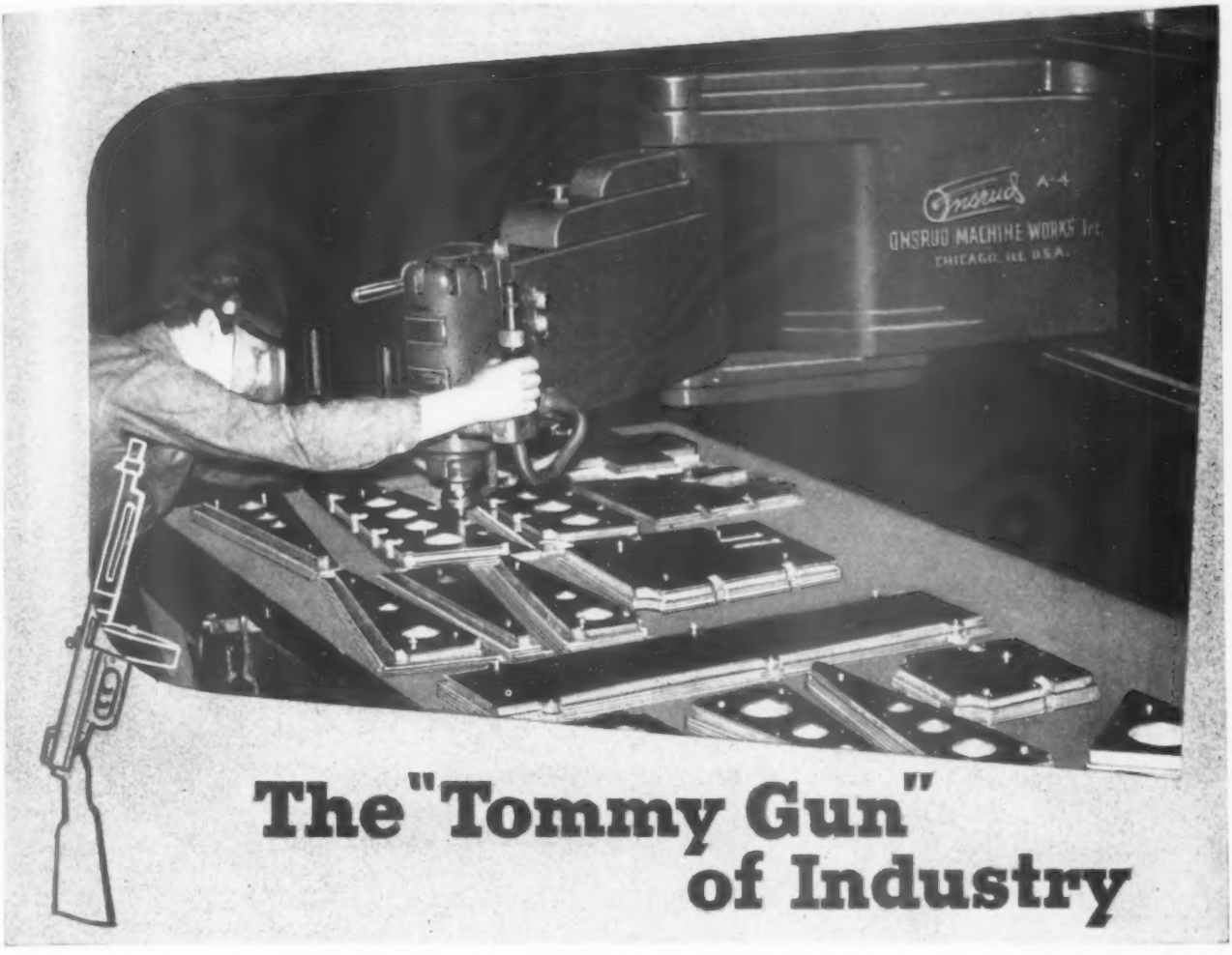
14 Inch Carbide Tool Grinder
Recent improvements announced.

PAPER FOR PROTECTION AGAINST CORROSION (K48)

Said to protect highly finished metal parts against corrosion, a new greaseproof, noncorrosive paper was recently announced by the Sherman Paper Prod-

(Continued on page 174)

Photo—Curtiss-Wright Corporation, Missouri Plants



The "Tommy Gun" of Industry

● The "Tommy gun" and similar weapons give a modern soldier tremendous fire power. Out of this development has sprung a whole new concept of warfare.

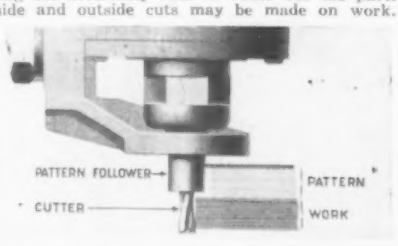
A similar revolutionary revision is taking place in the methods by which machining operations are carried out in modern industry. Back of this revision is the practical application of a principle new to metal working —the guiding of high speed cutters by templates or patterns instead of complicated mechanisms which must be carefully set for each operation. This method has already produced man-hour savings in fantastic amounts —and permitted single machines to do the work of several.

Onsrud Machine Works, working with the production engineers of the manufacturers concerned, has designed and created machines which today are speeding America's war production using a minimum of skilled labor. Tomorrow machines like these will bring higher efficiency in the production of peace-time goods.

Like the "Tommy gun" of the soldier, this kind of equipment makes many older methods inadequate and costly. That is something every manufacturer should remember as he plans for the future.

ONSRUD MACHINE WORKS, INC.
3927 Palmer Street, Chicago, Illinois
Sales Offices in all Principal Cities

Finished parts are cut from stacked flat or corrugated sheets by the Onsrud routing method. A pattern is fixed to the sheets. As the router head is fed to the work, the pattern follower travels along the pattern's side, and the routing bit accurately cuts or routs out the part. Both inside and outside cuts may be made on work.



MACHINE TOOLS AND METHODS FOR TOMORROW'S PRODUCTION

ucts Corporation, Newton Upper Falls, Massachusetts. Described by the manufacturer as a new development in the packing of war materials, this paper eliminates multiple wrapping operations.

Multiple wrapping operations are eliminated by combining two protective laminations in one paper. The inner ply is said to provide a greaseproof barrier for the retention of corrosion-preventatives used on metal products. The strong outer ply protects the greaseproof membrane against damage in transit.

Said to have been widely tested in aircraft, truck, tank and other types of ordnance factories, this paper meets all government specifications, according to the manufacturer.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

NEW LATHE FOR POLISHING (K49)

The new polishing lathe recently announced by the Crozier Machine Tool Company of Hawthorne, California has a clearance hole through the entire machine. This feature is said to permit polishing a portion of a long piece of work up to the maximum capacity of the lathe.

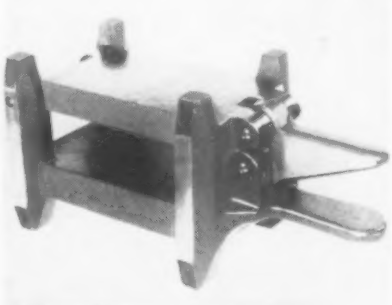
The New Crozier Polishing Lathe
Clearance hole through machine.

The manufacturer states that work can be loaded and unloaded while the spindle is in rotation. A double-face cam operating mechanism, hardened and precision ground, provides positive opening and closing of the collet. Adjustments are said to be made by turning the hand grips and no tools are necessary for the adjustments.

Offered in 14 models, the lathe has a switch and mechanical brake control which makes it adaptable to work which can be loaded better when the spindle is stationary. The entire motor is said to be dust tight, excluding all abrasive material.

NEW UNIVERSAL DRILL JIG (K50)

A new type basic drill jig unit was recently announced by Earl C. Parkhurst, 751 East Stepney Place, Inglewood, California. Constructed of cast nickel iron and normalized, the top, bottom and both sides of the jig frame and cover are finished.



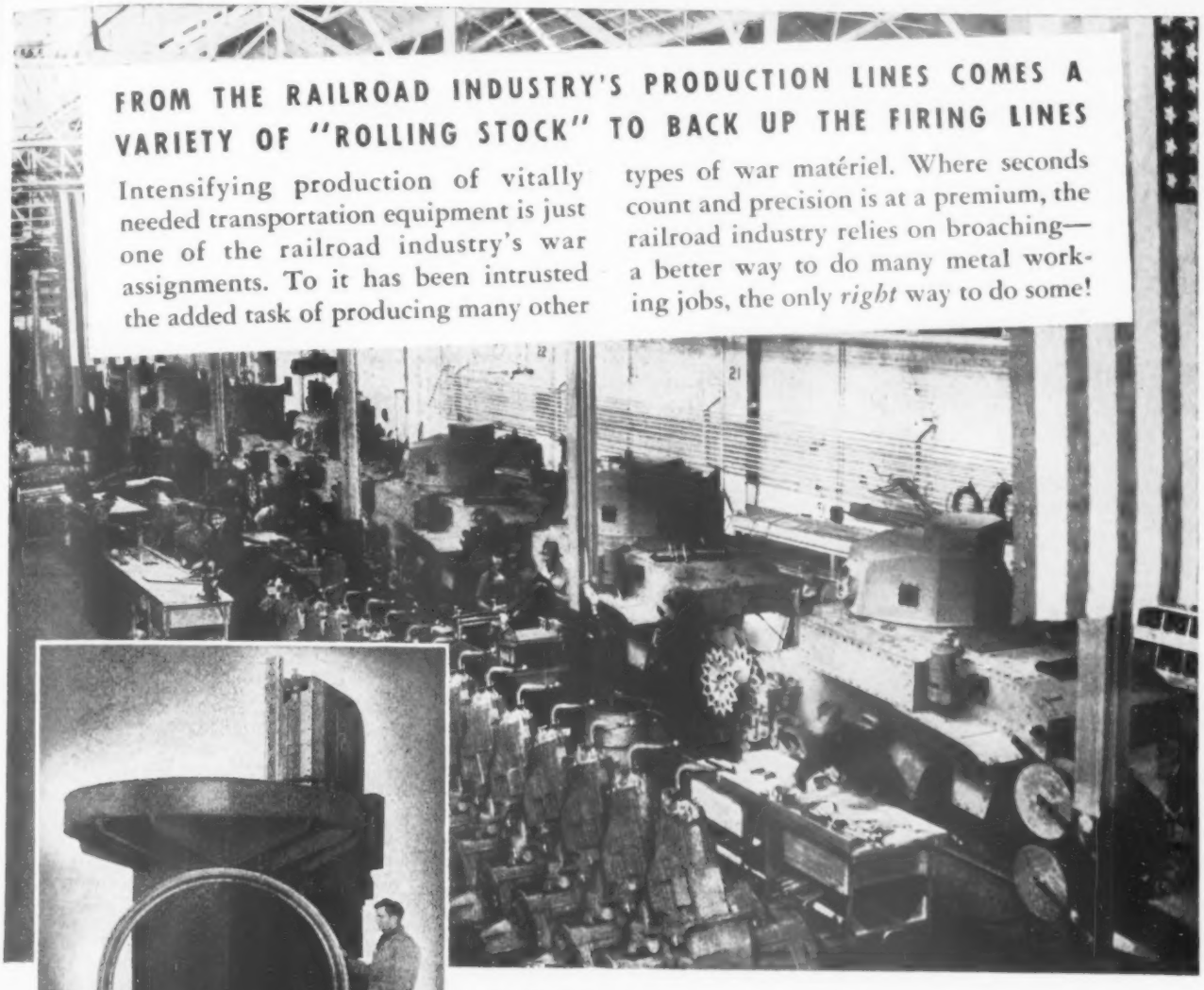
New Type Basic Drill Jig Unit
Simplicity of design claimed.

It is said to permit the toolmaker or driller to get into operation sooner. He has only to finish the base for location of part to be drilled, add side plates if drilling sides, add bushing and clamping and the jig is ready for production.

Simplicity of design of the jig is claimed by the manufacturer who states that it is comprised of only 3 castings and 4 pins and a special quick opening and locking device. The locking device

(Continued on page 176)

LINES BEHIND THE LINES



FROM THE RAILROAD INDUSTRY'S PRODUCTION LINES COMES A VARIETY OF "ROLLING STOCK" TO BACK UP THE FIRING LINES

Intensifying production of vitally needed transportation equipment is just one of the railroad industry's war assignments. To it has been intrusted the added task of producing many other types of war matériel. Where seconds count and precision is at a premium, the railroad industry relies on broaching—a better way to do many metal working jobs, the only *right* way to do some!

This big tank turret gear, taller than a six-foot man, is economically and automatically broached on an *American* surface broaching machine. No special skill is needed. One operator, one machine, and tooling by *American*—equal a precision job at a production rate!

Three internal teeth are cut and finished with each pass of the tool. At completion of the stroke the broach is hydraulically withdrawn from the cut, and the gear is indexed to next working position during the upward stroke. When the 348 teeth are finished the machine automatically stops, permitting easy and rapid reloading of a new blank.

BROACHING IS BETTER THE *American* WAY

American

BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILL. U.S.A.

also acts as a handle during drilling operations.

Called the "Parlec", this universal drill jig is made in seven standard sizes and users are furnished with master layouts. These layouts, when placed under the tool or part designer's drawing, quickly determine the size jig needed.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

NEW GRINDING WHEEL (K54)

Said to be specially designed for tool rooms and for faster grinding of hard steels, the new grinding wheel that recently was announced by American Emery Wheel Works of Providence, R. I., is of open, cellular construction (No. 15 Abrasive Content).

This open, porous construction is said to give plenty of chip-clearance and space for air cooling to cut hardest alloyed steels without loading or "burning." The porosity of the wheel is said to enable it to carry extra coolant when wet grinding.

The manufacturer states that deeper cuts can be taken with this wheel, that it cuts faster, and that it cuts freely and requires a minimum of dressing.

DRILLS WITH PLASTIC HOUSINGS (K55)

The most outstanding engineering feature of the new ¼ inch and ⅜ inch standard drills made of a new plastic material by Black & Decker is said to be the marked reduction in weight as compared with the former models using metal housings.

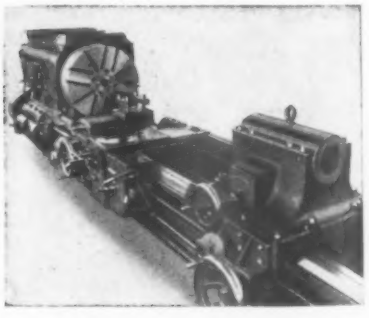
The new plastic material is called "Drillite" and is made with a shredded cotton duck base. This plastic is said to be heat resistant and a perfect insulator against electric shock.

New Black & Decker Drills
Feature Plastic Housings

Both units are offered with either end handle or side handle control and are equipped with pistol grip and trigger switch. The universal motor operates on either alternating or direct current.

NEW HEAVY DUTY LATHES (K56)

Two new extra heavy duty lathes were recently announced by the Sommerfeld Machine Company of Braddock, Pa. Having capacities of 36 and 42 inches, these new lathes are said to round out a line of lathes made by this concern with capacities from 27 to 60 inches. These new units are made in



New Extra Heavy Duty Lathe
Made in 2 models, 2 types.

(Continued on page 178)

New Low-Cost SURFACE GRINDER

. . . with NEW FEATURES not found in Grinders costing *many times as much*

Check the outstanding features of this DELTA-Milwaukee Toolmaker—read the specifications below—and then try to estimate the price of this husky, accurate, portable Surface Grinder. You will probably be off by more than 100% because this versatile machine has advantages which are not present in surface grinders costing many times its remarkably low price. It is ideal for surface grinding, tool sharpening and any grinding operations within its range—and because of its low cost can be quickly swung into any spot to free machines costing ten times as much.

Superior Features of this TOOLMAKER SURFACE GRINDER

There are so many unusual features on this new Surface Grinder that it has to be seen and operated to be fully appreciated—but here are a few of the "highlights":

Improved, well-designed spindle—the "heart" of any Surface Grinder—made extra-long with bearing at either end, widely spaced. Forward bearing is large surface taper bronze bearing of design usually found only in much more expensive grinders—rear bearing is sealed-for-life ball bearing.

Special Wheel Mounting System—utilizes two-piece adapter so that either wheel, or wheel and adapter, can be removed. Thus once wheel has been trued up, wheel and adapter can be removed and replaced without need of re-dressing wheel.

Improved Table—Smooth operating, with conveniently located control handles—has long ways so that table rides solidly. Gibs provided so that all play due to wear can be eliminated. Micrometer collar, with wide graduations on the traverse adjustment permits accurate settings. The table is provided with T-slot for clamping fixtures or magnetic chuck in place.

Specially Designed Column—of one-piece construction, cast of high-tensile iron, normalized and accurately ground to close tolerances. Steel gib guides bracket yoke so it is always in perfect alignment. Entire column together with bracket, can be rotated 360°.

Send for Catalog

giving full details and prices on the new Delta Surface Grinder—and also showing full line of Delta drill presses, band saws, abrasive finishing machines and other Delta low-cost machine tools. Get in touch with nearest Delta Industrial Distributor or send coupon below.

SPECIFICATIONS

Maximum length that can be ground—13½"; Maximum width that can be ground—6"; Maximum space under 7" wheel to table—9½"; Maximum space under 7" wheel to B & S No. 510 Magnetic chuck—6"; Table surface 5¾" x 12"; Traverse feed; one graduation is .001"; Maximum adjustment of wheel by means of micrometer is ⅛"; each graduation is .0005"; Minimum diameter cup wheel with standard guard in place 3¼"; Maximum diameter wheel 7".

THE ARMY-NAVY "E"—awarded for excellence in the production of machine tools vitally needed in the war effort.

DELTA
MILWAUKEE

The Delta Manufacturing Company
610- E. Vienna Ave., Milwaukee, Wis.

Gentlemen: Please send me your new catalog giving full details and prices on the Delta Surface Grinder, and your full line of low-cost machine tools.

Name .....

Address .....

City ..... *State* .....

two styles.

Type BT bores and turns simultaneously while type T is for turning only. The manufacturer states that these new lathes are intended for the rapid production of such items as medium gun tubes and hollow propeller shafting as well as solid products of any length. It is claimed that they are built for fast roughing and accurate finishing.

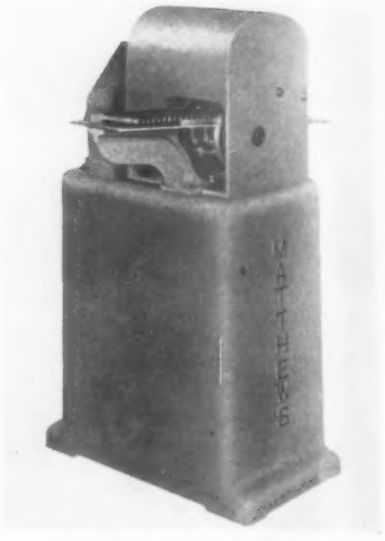
INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

MACHINE FOR MARKING PARTS (K57)

Printing color bands, insignia and other data on cylindrical bodies of grenades, signal flares and cartridge cases is typical work done on the newly developed printing machine manufactured by Jas. H. Matthews & Company of Pittsburgh.

The machine in the accompanying illustration prints 20 MM cartridge cases in one color. The machine has an input gravity feed chute into which parts are placed by hand and rolled by gravity to the printing unit.



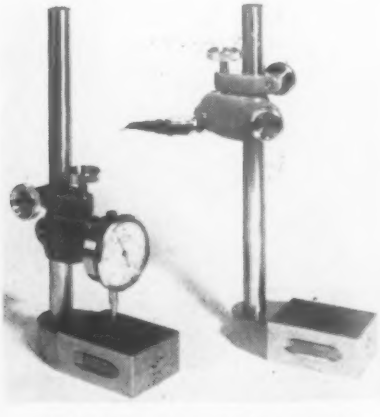
New Parts Marking Machine
Has a gravity feed chute.

The printing unit consists of a printing plate cylinder into which interchangeable synthetic rubber type is placed; ink pan, roll and doctor which places ink on the face of the printing plate; and cradle rolls which hold the piece to be printed. The cradle rolls are multiple stage and set into a shaft.

The drive is by a ¼ hp geared head motor with a three speed cone pulley belt drive.

NEW HEIGHT GAUGE (K58)

Outstanding feature of this new height gauge and comparator is said to be its close adjustment control. The manufacturer, the H. E. Dickerman Mfg. Company of Springfield, Mass., states that one complete turn of the adjusting thumb screw moves the indicator holder less than six-thousandths of an inch, without backlash, due to the arrangement of different lead threads in the sliding member.



Height Gauge and Comparator
Has close adjustment control.

Another feature is said to be its rigidity. The gauge is said to have a heavy base and a substantial 10 inch column. It is designed and constructed to use

(Continued on page 180)

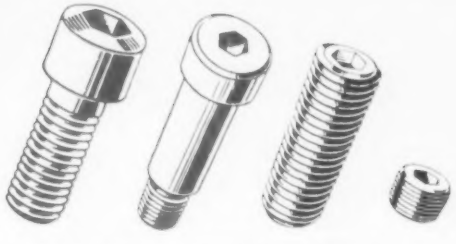
...in the Bruisers that pack our "Sunday Punch"...

To rock the enemy back on its heels, to slug a path through strong defenses, to unwind the "Sunday punch" that will put the Axis away, – our Army depends on the big gun.

To reach its position, it must lurch over bomb-pocked terrain, and, firing, withstand the brutal shock of bursting T.N.T. In no other weapon of war is so much required of assembled parts of steel.

No "doubtful" materials can be used in its construction, to threaten failure at a crucial moment. Every detail, down to the smallest fastening, must be the most dependable, that modern engineering can deliver. That is why Parker-Kalon Quality-Controlled Socket Screws are on the "preferred list" of so many manufacturers of important war weapons.

The unparalleled check-routine supervised by the Parker-Kalon Quality-Control laboratory eliminates the "doubtful screws" . . . screws that *look* all right but fail to *work* right. You can be *sure* of the physical and mechanical characteristics of P-K Socket Screws . . . yet they cost no more! Parker-Kalon Corporation, 190-198 Varick Street, New York, N. Y.



"Quality-Controlled" means . . .

Complete test and inspection covering: – Chemical Analysis; Tensile and Torsional Strength; Ductility; Shock Resistance under Tension and Shear; Hardness; Head diameter, height, and concentricity; Socket shape, size, depth, and centricality; and Thread fit.

PARKER-KALON

Quality-Controlled

SOCKET SCREWS

Give the Green Light to War Assemblies

both standard dial and small type indicators. It can be used as a height gauge, comparator or for scriber use.

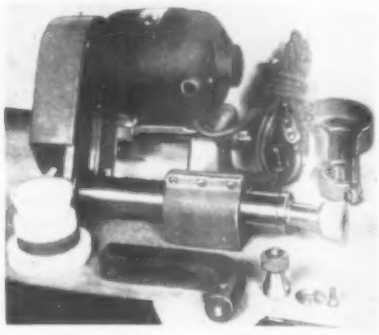
NEW TOOL POST GRINDER *(K59)*

A small heavy duty grinder for internal, external, face and taper grinding on lathe, shaper, planer, miller or bench has recently been announced by Lempco Products, Inc., 5700 Dunham Road, Bedford, Ohio. This new machine grinds holes 8½ inches deep and is said to have an exclusive quill adjustment which provides the equivalent of two different length quills.

This adjustment can be made because the motor can be shifted 2 inches on a slide bracket and the grinding quill is adjustable 2 inches. The quill assembly is said to be balanced statically and dynamically. It is mounted in four pre-loaded matched sets of ball-bearings constantly lubricated in a fog oil bath.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.



New Small Heavy Duty Grinder
Has special quill adjustment.

Spindle speeds of 6,000 to 13,000 rpm are provided by a two-step "V" pulley. Standard equipment includes wheel guard, diamond dresser, abrasive wheels and spindle extension.

NEW TOOL FOR TESTING SPRINGS *(K60)*

A new tool for testing compression springs in sizes to 2½ inches in diameter and 7 inches in length was recently announced by The P. A. Sturtevant Company of Addison, Illinois. The manufacturer states that this new tool not only makes it possible to rapidly measure the recoil pressure of a spring, but also makes it possible to accurately match sets of springs such as valve springs for internal combustion engines.

Said to differ in design and principle from other spring testers, it is operated

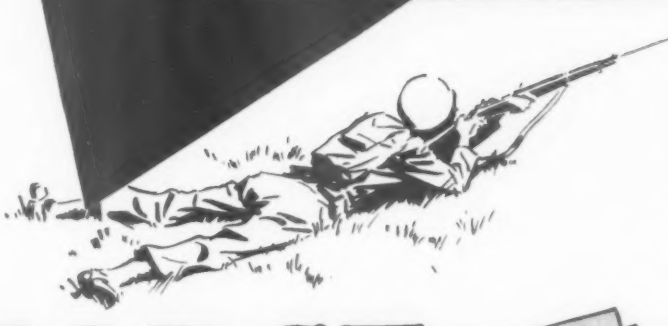
Compression Spring Tester
Operated with torque wrench.

with a standard torque wrench which serves as the operating lever and provides the measuring element. It is claimed that the operator does not have to watch multiple dials since a sounding device is used that indicates when the spring has been compressed to the test point.

The compression of the spring is against a rigid platform. According to the manufacturer, the tester can be adjusted for any test by regulating the height of the test platform to match the length at which the spring is to be tested. This platform is mounted on a threaded column and is raised or lowered by revolving. A milled flat on the column carries the scale which is calibrated to

(Continued on page 182)

THE PRODUCTION ARMY NEEDS HARD-HITTING SMALL ARMS, TOO



When you're shooting for big production gains, make sure the "small arms" you are using – the cutting tools – are accurate, efficient, dependable!

MORSE

THERE *IS* A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY

NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.

sixteenths of an inch and is used in adjusting the platform. Adjustments of test lengths can be made up to 0.003 inch.

This tester is also said to have been used in proof-testing the strength of press fits and for light arbor press production operations.

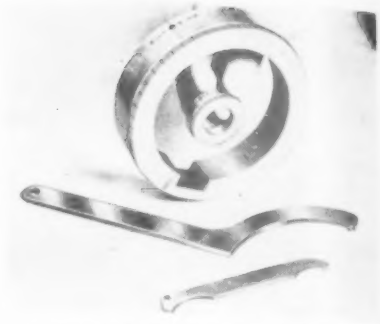
INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

MICROMETER SPACING COLLARS (K61)

The announcement of micrometer spacing collars in sizes from ⅞ to 5½ inches was recently made by The Dayton Rogers Manufacturing Company of Minneapolis. These adjustable spacing collars are said to eliminate the necessity of using milling machine cutter arbor shims and also give the required positive adjustment for spacing of the straddle mills without removing any of the cutters or collars from the milling machine cutter arbor.

A special pin spanner wrench is furnished with each size, making it possible to quickly adjust the spacing collars as to the plus or minus dimension required, according to the manufacturer.



New Micrometer Spacing Collars
Range from ⅞ to 5½ inches.

BLOW GUN FOR CLEANING (K62)

Said to enable operators to speedily blow out chips, dust, dirt, filings and scrap from castings, die surfaces, machine parts and motors, the blow gun manufactured by W. R. Brown Corporation, 5720 Armitage Avenue, Chicago has trigger action and pistol grip.

Operating on individual or air line compressors up to 250 pounds pressure, this blow gun is tapped for standard ⅛ inch pipe thread and is equipped with an adapter for standard air hose fittings.

The gun barrel has a removable nozzle which is said to be quickly interchangeable with long spouts to reach deep cavities and crevices. It also has a special solvent resistant soft rubber air valve disc that is said to stay tight and prevent waste of air.

Trigger Action Blow Gun
Cleans parts and machines.

PUMPING UNIT FOR TESTING INSTRUMENTS (K63)

Said to be used in war plants for testing all sorts of instruments, this motor-driven rotary pumping unit is furnished by Leiman Bros., Inc., Newark, N. J. Among the instruments said to be tested by this vacuum creating outfit are directional gyros, artificial horizon instruments, and altimeters.

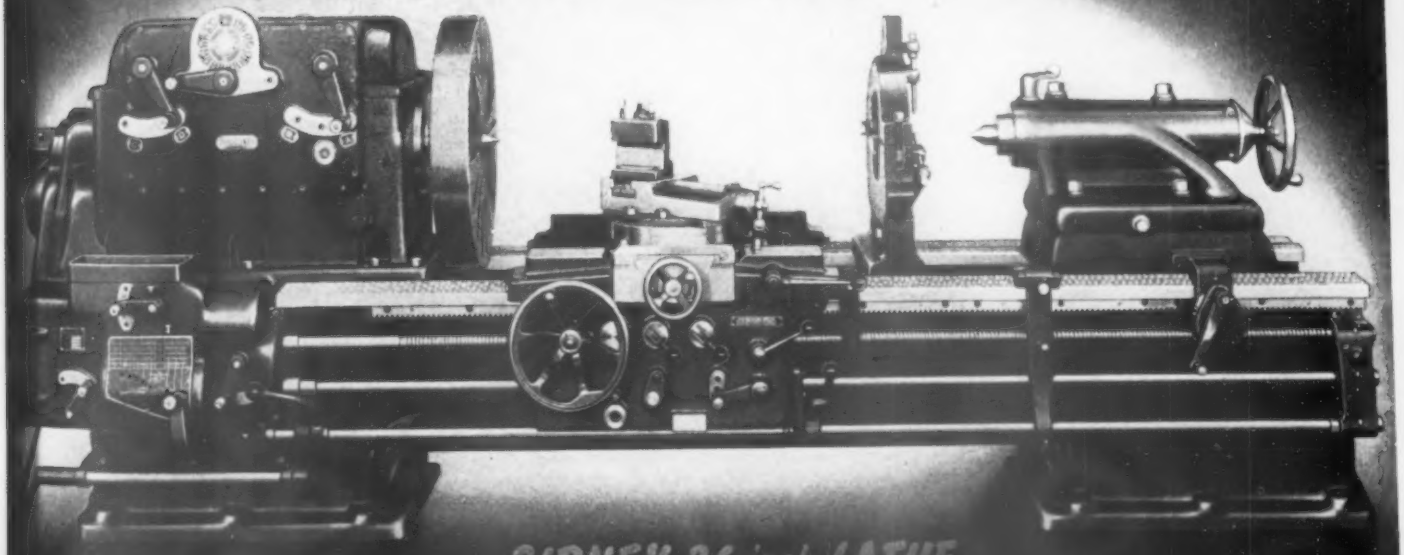
According to the manufacturer, the vacuum and pressure may be adjusted to any degree desired. The machine is furnished with full automatic controls and automatic lubrication. THE END.

Sidney Lathes

● The lathes today that will stand the strain of "round-the-clock" production—maintain accuracy—keep needed production flowing to our many fronts are the lathes that will be selected for our future output when costs will take a more prominent place in production plans.

Sidney Lathes operating in airplane plants—Shipyards—munitions plants—tank and industrial plants are meeting the test of urgent war production.

The 36 inch Sidney Lathe shown is designed and built to give the utmost of production—the greatest possible versatility—and long, trouble-free life. Massively built, 16 speed continuous tooth herringbone geared head and versatile gear unit are a few of the many points of Sidney construction that make for greater production—dependable accuracy—and longer, care-free life.



SIDNEY 36 inch LATHE

The SIDNEY MACHINE TOOL Company

Builders of Precision Machinery

SIDNEY ESTABLISHED 1904 OHIO

AUTOMATIC PRECISION GRINDING

WITH the prevailing shortage of skilled manpower, the necessity for Automatic Precision Grinding equipment is greater than ever before. HILL *Open Side* Hydraulic Surface Grinders are today producing ground finishes to extremely close tolerances with operators whose experience is limited to the present emergency • Your production schedule on finish ground parts can be easily maintained with a HILL Horizontal Spindle *Open Side* heavy duty precision surface grinder • A complete range of sizes from 5 to 20 feet long are available with table widths of 18, 24, 30 and 36 in.

ALSO BUILT IN VERTICAL SPINDLE DESIGN

The HILL ACME Co.

6400 BREAKWATER AVE • CLEVELAND, OHIO

NEW LITERATURE*

OF INTEREST TO PRODUCTION EXECUTIVES

*T.M. REG. U.S. PAT. OFF.

(703) Pneumatic Die Cushions

Installation Instructions and Service Manual For Your Pneumatic Die Cushion. 28 pp. Dayton Rogers Manufacturing Company, Minneapolis, Minn. This service manual contains simple, yet detailed description, as to pneumatic die cushion equipment. It mentions construction, operation, care, and use. Included are a limited number of representative installations with illustrations.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(704) Plastic Parts

Plastics For Your War Production Parts Problem. 4 pp. Creative Plastics Corporation, Kent and De Kalb Avenues, Brooklyn, N. Y. This new folder illustrates and describes the possibilities of plastic parts in war production applications. Photographs show nearly a score of plastic parts recently produced by this concern for war use. It emphasizes that this plastic fabrication is done without molds.

(705) Grinder

Rotorex Universal Tool and Cutter Grinder. 16 pp. Douglas Machinery Co., Inc., 150 Broadway, New York City. This new booklet illustrates this grinder and its application in sharpening tools of all kinds. It describes the design and features of the grinder and lists the standard equipment.

(706) Contour Saws

Doall Contour Saws. 265 pp. Doall Service Company, 1201 Thacker Street, Des Plaines, Illinois. This new book is said to give comprehensive study to the art of contour machining, its cutting tools and the Doall training program. Over 80 per cent of the text is said to be shown through pictures. A 44 page section in the back of the book gives specific information on machine tools and machine shop practice. 85 pages of the book show how contour machining replaces conventional machining.

(707) Bushings

Atlas Bronze Bushings. 84 pp. Atlas Brass Foundry, Los Angeles. This new catalog lists sizes and prices of hundreds of finished bronze and porous oil-retaining bearings. Sizes and grades listed in this catalog are ready for immediate shipment, according to the manufacturer. Full instructions for ordering are included.

(708) Fans

Heavy Duty High Temperature Fans. 12 pp. Despatch Oven Company, Minneapolis, Minn. This new bulletin describes the fans made by this concern and lists the construction features. Complete specifications, including dimension charts, capacity tables, thermal capacity chart and conversion chart are given.

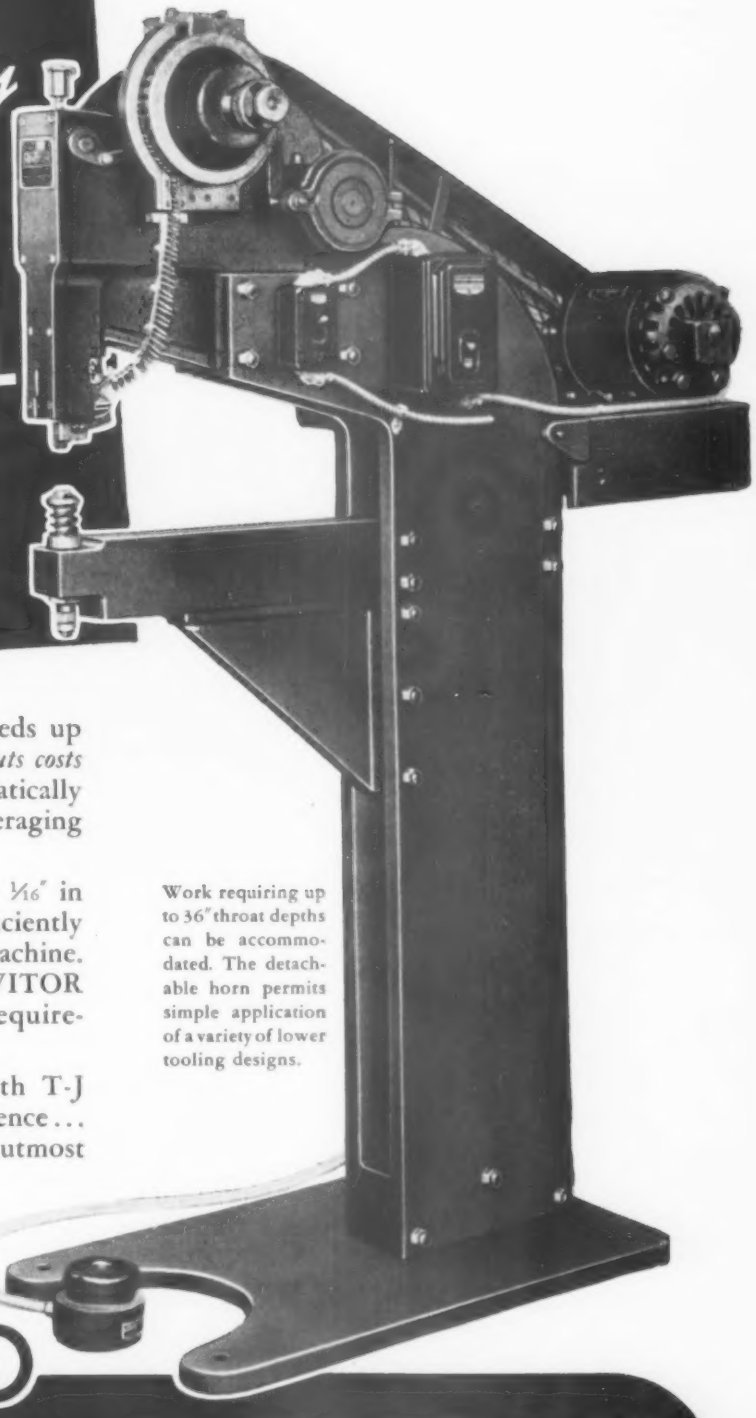
(709) Welding

For Resistance Welding by Frostrode. 6 pp. Frostrode Products, 19003 John R. Street, Detroit. This new bulletin announces an entirely new development in refrigerated welding electrode design. Illustrations and descriptive matter on the design, construction and operation of the electrodes and adapter holders are included.

(Continued on page 188)

1600 PER HOUR

Automatically
FEEDS AND SETS
$\frac{1}{4}$" DIAMETER
SOLID STEEL
RIVETS



THIS versatile "RS" RIVITOR speeds up riveting...does a better job...and *cuts costs* for many industries today! It automatically feeds and sets rivets at rates averaging 1600 per hour!

Solid rivets ranging from ¼" to 1/16" in diameter are handled rapidly and efficiently (with different tooling) by this machine. Thus, the Tomkins-Johnson RIVITOR offers greater capacity...meets requirements of a greater number of jobs.

Ruggedly built...designed with T-J know-how based on long experience... this RIVITOR meets demands for utmost dependability and long life.
Write today for bulletin R-4.
The Tomkins-Johnson Co.,
Jackson, Michigan.

Work requiring up to 36" throat depths can be accommodated. The detachable horn permits simple application of a variety of lower tooling designs.

FOR TOUGH JOBS...SPECIFY T-J

TOMKINS-JOHNSON
RIVITORS

(710) Sawing

The Motch & Merryweather Triple-Chip Method. 8 pp.. The Motch & Merryweather Machinery Company, 715 Penton Building, Cleveland. This piece of new literature tells how this concern's cold sawing method works and what it accomplishes. Many illustrations are included and a number of features are described.

(711) Bushings and Mountings

Rubberflex Bushings and Mountings. 4 pp. Bushings, Inc., 3442 West Eleven Mile Road, Berkley, Michigan. A line of insulated bushings and mountings that are now available with rubber, rubber reclaim or synthetics as the insulating medium is described in this new folder and engineering data sheet.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(712) Files

Graham Hand Cut Rotary Files. 6 pp. Graham Rotary File & Tool Company, 387 Fourth Avenue, New York City. This new folder shows a great variety of these rotary files with illustrations actual size. Number, diameter and depth of cut of each file is given. Other general information is included.

(713) Bench Miller

Pratt & Whitney No. 3 Model "C" Universal Bench Miller. 8 pp. Pratt & Whitney, West Hartford, Conn. This new booklet describes in detail and illustrates the various features and parts of the machine. Available attachments are shown and complete specifications are included.

(714) Work Simplification Ideas

These Are Your Weapons. 36 pp. Plomb Tool Company, Los Angeles. This new booklet discusses 14 ways to increase war production. Published as an aid to winning the war, it does not contain advertising. It can be used in the training of new workers and is completely illustrated.

(715) Inspection

Safeguard Your Production From the Scrap Pile. 4 pp. George Scherr Company, 128 Lafayette Street, New York City. This new folder fully describes the Scherr Limited Budget Inspection Laboratory. It is illustrated and 14 types of measuring instruments, tools, gages and optical inspection devices are mentioned.

(716) Brazing Alloys

Low Temperature Brazing of Metals with Sil-Fos and Easy-Flo. 18 pp. Handy & Harman, 82 Fulton Street, New York City. Why the use of these brazing alloys has increased and how one can profit from their use are subjects discussed in this new booklet. It is fully illustrated and shows many applications.

(717) Bushings

Heli-Coil Spark Plug Bushings. 4 pp. Aircraft Screw Products Company, Inc., 47-23 35th Street, Long Island City, N. Y. This new specification folder deals with a spark plug bushing that is said to have been adopted by several leading aircraft engine builders. The folder is illustrated.

(718) Revolving Table

Ohio Revolving Tables. 12 pp. The The Ohio Machine Tool Company, Kenton, Ohio. This new bulletin illustrates and describes the various models of both the round and the square revolving tables made by this concern. Power feed for both types of table is also discussed. Specifications are included.

(719) Coated Abrasives

Blue Print for Better, Faster Production. 16 pp. Behr-Manning, Troy, N. Y. A line of coated abrasive gadgets is described in this new booklet. Full price information is given and illustrations show many of the operations where the abrasive gadgets can be used to the greatest advantage.

(720) Alloy Metals

Alloy Metals Finding List and List

(Continued on page 190)

A *Tribute....*
and A *Responsibility*

When the men and women of Stanley Electric Tools, Division of The Stanley Works, received the Army-Navy "E" award on February 13, it was a much prized tribute to a great production team during the one hundredth anniversary year of the Company.

Upon their shoulders has rested a triple burden. They have been called upon to supply (1) tools for the armed forces . . . to construct and maintain camps, bases, and barracks; (2) tools for war industry . . . to build plants, ships, planes, and other implements of war; (3) tools for the home front . . . to maintain farms, schools, institutions and essential civilian industries.

Hand in hand with this honor for past performance goes a great responsibility for future performance. These men and women fully realize this responsibility. Far from being contented with the "contribution to Victory" already made, they are earnestly striving to make an even greater contribution in the future. Stanley Electric Tools, Division of The Stanley Works, New Britain, Connecticut.

1843 STANLEY 1943

TRADE MARK

of Sources. 16 pp. Hobart Brothers Co., Troy, Ohio. This is the first in a series of bulletins covering special information and new developments in metals, to help engineers, designers, metal workers and purchasing departments.

(721) Milling Machine

The Cleveland No. 1½ Horizontal Production Milling Machine. 4 pp. The Sommer & Adams Company, Cleveland. The various features and parts of this machine are pointed out and described in this new folder. Both dimensional drawings and photographs of the machine are shown. A list of general specifications are included.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(722) Broaching

Broaching Do's and Don't's. Colonial Broach Company, Detroit. This is a poster-folder suitable for wall mounting in broaching departments. It measures 17 by 11 inches and answers questions frequently asked about broach use. It summarizes recommendations concerning broach alignment, correct mounting of broaching fixtures and precautions to prevent broach breakage.

(723) Lathe Pictures

Motion Pictures On the Operation of a Lathe. South Bend Lathe Works, South Bend, Indiana. This material describes the moving pictures being loaned by this concern. Information is given on how to get these films for training schools, plants, and groups interested in war production.

(724) Portable Electric Tools

Hicycle Portable Electric Tools for Industry. 68 pp. Chicago Pneumatic Tool Company, 6 East 44th Street, New York City. This is a catalog that describes and illustrates drills, reamers, screw drivers, nut runners, stud setters, tappers, radial arms, grinders, sanders, buffers and polishers. Complete specifications are included.

(725) Hard-Facing

Hard-Facing with Coast Metals Makes Your Equipment Lost Longer. 12 pp. Such subjects as hard-facing weld rods, properties of these weld rods, examples of outstanding performance and rods to use on different applications are discussed in this new publication.

(726) Tools

Here Are the Tools for Increased War Production. 10 pp. Willis Stutson Associates, 184 North Wacker Drive, Chicago. Centering attachments, portable grinders, boring bars, indexing fixtures, tools and reamers, vises, boring heads, pumps and high speed cutting tools are among the items illustrated and described in this new bulletin.

(727) Gear Testing

Find Out Before Assembly Whether Your Gears Are Noisy. 8 pp. National Broach and Machine Company, 5600 St. Jean Street, Detroit. Gear sounds and their interpretation is one of the subjects discussed in this new booklet on gear testing by sound with the machine manufactured by this concern.

(728) Nitriding Furnaces

Nitriding Furnaces. 99 pp. The Nitralloy Corporation, 230 Park Avenue, New York City. This is said to be a practical exposition of the constructional features, capacities, operation and instrumentation of this type of furnace. Illustrations are included and the booklet is divided into 4 parts. Part I is on Nitriding and Nitriding Furnaces; Part II, Ammonia and Its Handling; Part III, Determination of Furnace Size for Nitriding; and Part IV, Instruments for Measuring Ammonia Flow.

(729) Midget Cutter Gauge

A free midget cutter gauge, printed on heavy cardboard, is being offered by Severance Tool Industries, Inc., Saginaw, Michigan. Dept. A. It is said to provide accurate measurements for tool diameters, radii, number of teeth per inch, angles of cutter teeth, decimal equivalents, recommended operating speeds for midget milling cutters and other information. It is said to be of

(Continued on page 192)

CONTOUR GRINDING MACHINE

DO YOU NEED A SPECIAL MACHINE ?!

AUTOMATIC PROFILING MACHINE

AUTOMATIC MILLING MACHINE

HOLLOW MILLING MACHINE

DRILLING MACHINE

REAMING MACHINE

ARMOR BORING MACHINE

Our job is to design, engineer and build special machines to increase production capacities

Take a look at our files, for example: Here's a contour grinding machine that grinds a radius shape around the bosses on a master rod for aircraft engines. The machine boosted production to four rods an hour. The automatic profiling machine, shown next, is used for chamfering and radius milling along edges of a recess around piston pin hole. It delivers 40 pieces an hour. The third picture shows a machine that mills an oil groove in trunnions.

And so on—we could enumerate scores of machines—each engineered and built to meet specific requirements—in some cases producing machines that combined operations formerly performed on several independent machines.

We'll be glad to discuss your particular production problems with your engineers, without obligation, of course. Call, wire, or write.

BUY WAR BONDS

LeMaire TOOL & MFG. CO.

2663 S. TELEGRAPH ROAD ▲ DEARBORN, MICHIGAN

ENGINEERS AND BUILDERS OF PRODUCTION MACHINES

value to purchasing and departmental heads as well as shipping and receiving departments and tool crib clerks.

(730) Work Shift Schedule

Shiftograph. George S. May Company, 2600 North Shore Avenue, Chicago. Printed on heavy cardboard, this instrument offers a systematic procedure for the rotation of shifts. To use as a perpetual work shift schedule, the user turns the dial and can tell at a glance what shifts certain crews will work, the days they work and their days off. It is said to provide for several different plans of rotation wherein all employees are treated alike.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(731) Grinder

Reltool Vertical Surface Grinder. 4 pp. Reliable Tool and Machine Works, Milwaukee, Wisconsin. This new folder describes and illustrates a rotary chuck type of vertical surface grinder. Information on capacity, chuck, wheel, speeds, motors, floor space, coolant and weight are included in the folder.

(732) Cutting Fluids

Cutting Fluids. 12 pp. The Pate Oil Company, Milwaukee, Wisconsin. The purpose of this new booklet is to acquaint industry with the line of products made by this concern and the application of these products. Many types of cutting fluids and a list of general recommendations are discussed.

(733) Metal Cutting System

Atkins Curled Chip Metal Cutting System For Fast, Efficient War Production. E. C. Atkins and Company, Indianapolis, Indiana. This booklet discusses and illustrates the Atkins curled chip system. Information is given on the circular milling saw and the 3 dowel drive. Also mentioned is the segmental cold saw with curled chip tooth and a powersaw blade. Specifications are listed and sawing records with ferrous and non-ferrous metals are included.

(734) Head Stock Centers

The New Head Stock Centers for Grinders, Lathes Etc. 1 pp. Chicago Manufacturing and Distributing Co., 1928 West 46th Street, Chicago. The leaflet describes and illustrates various types of centers made by this concern.

(735) Hard-Facing

Callite Tungsten No-Wear Metal. 4 pp. Callite Tungsten Corporation, Union City, New Jersey. Just released, this bulletin describes a cemented carbide for hard-facing. Methods of application and typical uses of the material are included. Advantages and physical characteristics are given.

(736) Training

The National Apprenticeship Program. 8 pp. War Manpower Commission, Apprentice - Training Service, Washington, D. C. This booklet gives a general picture of apprentice training in the United States and the way in which this agency is cooperating closely with employer and employee groups in helping to improve the methods of training workers for jobs requiring all-round skills.

(737) Gaging Practice

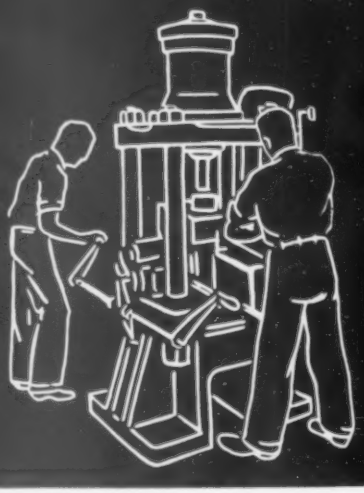
Dimensional Control — Theory and Industrial Application. The Sheffield Corporation, Dayton, Ohio. $3.50. This is a portfolio of 40 classroom charts, 27 by 32 inches. It is a revised edition of a similar set issued some months ago and covers basic definitions of such terms as limits, allowance, tolerance, clearance and interference; the principals of Go and No Go gages, wear allowance, gagemakers' tolerances and gaging policy. A 28 page booklet is included with the charts and outlines a talk to be given in connection with them.

(738) Optical Projection

Beyond a Shadow of a Doubt. 18pp. Jones & Lamson Machine Company, Springfield, Vermont. This new booklet presents the advantages and possibilities of inspection and measurement by optical projection. Actual work done by the comparator is illustrated.

THE END.

ANNOUNCING MODEL "K" SERIES Hydraulic Presses



A new type of "Hy-Mac" hydraulic press that may be adapted to capacities up to 150 tons, (identified as a "K" Series) is operated by a separate motor driven power units. It is a press that is ordinarily manually controlled from a four-way valve—automatically cutting-off when the predetermined pressure or tonnage has been reached—ipm. of closing speed, power speed and opening speed as per specifications. The frame of the press is made up of heavy castings bolted together by steel tie rods with the power cylinder assembled vertically on the top and above a base platen 19" (right to left) x 13¼" (front to rear) on the 75- and 100-ton presses. The platen is 1" larger in each dimension on the lighter models and 1" or ½" smaller on the larger ones because of 3" instead of 4" tie rods on the former, and 4½" or 5" tie rods on the heavier types. Maximum daylight—the length of stroke, diameter of cylinder are built to specification, the bore and stroke varying in ratio to the capacity required. The platen is 27" from the floor—height 75-ton press—overall is 82" (varying a few inches one way or other depending upon length of stroke)—without power unit, the press occupies a floor space of 25" x 50"—power unit may be adjacent to press or a remote installation.

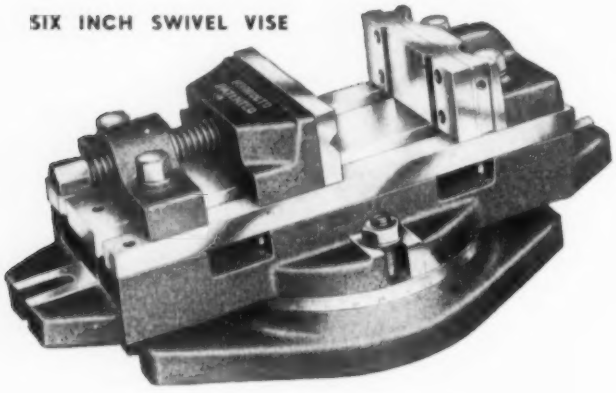
...del K75 (Illustrated)—...ons at 2000 lbs. per sq. ...the cylinder—10" bore ...9" stroke—here our fa...ties for making fixtures ...re used—the set-up pro... for two operators—...ible arrangement.

HYDRAULIC MACHINERY, INC.
12825 FORD ROAD
DEARBORN, MICHIGAN

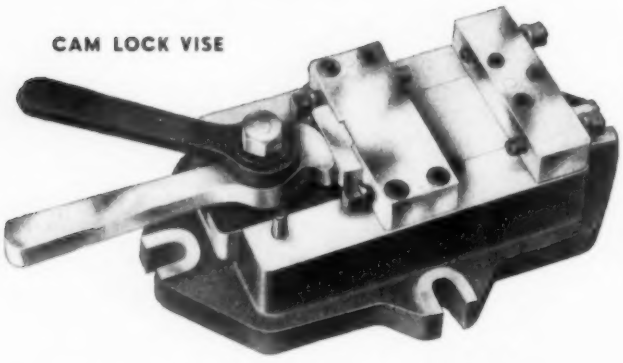
HYDRAULIC MACHINERY

PRODUCTO .... Vises ..

SIX INCH SWIVEL VISE



CAM LOCK VISE



Why waste time with old or worn Vises for Milling Machines, Drill Presses, etc.? Producto Modern Machine Vises have certain features for extra strength and gripping power. Most wearing parts are hardened for long wear and tear.

Screw-acting Vises—3 sizes—4½", 6" and 9".
Cam Lock Production Vises—3 sizes—4", 5" and 7".

Quick-Lok Vises for Drill Presses and Surface Grinders 2 sizes—3" and 4".

Large production schedule insures reasonably quick shipments.

Ask for 8 page circular for full information.

The

PRODUCTO MACHINE COMPANY

940 HOUSATONIC AVE. BRIDGEPORT, CONN.
3017 MEDBURY DETROIT, MICH.

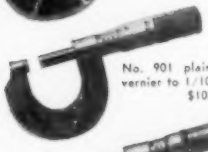
PREVENT SCORED HOLES WITH UNIVERSAL FLOATING CHUCKS

For drilling, counter boring, reaming or piloting from a lead hole you can't improve on the Universal Floating Chuck. Adjustable spring pressure compensates for tool weight allowing increased feed without danger of marred holes. Designed for horizontal operation in screw machines and turret lathes. Write for facts on Universal Floating Chucks, Standard Chucks and Centering Chucks.

UNIVERSAL ENGINEERING CO.
FRANKENMUTH · MICHIGAN

TO SPEED DELIVERIES REED PRODUCES THESE FOUR TYPES OF MICROMETERS.

No. 801 plain, to 1/1000" $6.25 list



No. 901 plain with vernier to 1/10,000", $10.25 list

No. 802 plain, to 1/1000" $7.00 list

No. 802 plain with vernier to 1/10,000", $8.75 list

REED MICROMETERS Have Been Manufactured in the U. S. A. for 30 Years

1. Lead accuracy over the full range of the screw is within a fraction of 1/10000" due to REED'S exclusive process used in forming the micrometer thread. This process makes variations virtually impossible.
2. Longer life of the micrometer screw due to a burnishing process which compresses the surface of the thread making the steel more dense, resulting in greater resistance to wear.
3. Easy reading graduations on thimble and vernier due to freedom from glare and reflection.
4. Fine, sensitive touch because of the smoothness and accuracy of the thread over its full length.

Write for literature and deliveries.

GEORGE SCHERR CO., INC.
132 Lafayette Street New York, N. Y.

Machinists Tools. Write for full details.

GS TOOL CHESTS. Fine workmanship. Several types. Write for literature.

Magne Blox for holding work on magnetic chuck . . . $14.50

Radius Dresser for grinding wheels . . $46.00 with diamond

DIAL INDICATOR fully guaranteed for accuracy, with attachments $18.00

Handy Andy Says—

T.M. REG. U.S. PAT. OFF.

WHILE we stretched the April deadline to its elastic limits, to get in the pics and general news of the Annual, we had to defer the behind-the-scenes activities.

At that, I can only tell what I saw and heard, and as you know, my hearing is erratic besides which I can't read my notes after they're cold. (Frank Martindell will understand). But that's all right; I never tell everything I see and hear anyway.

Trip Milwaukeeward uneventful, the moon shining bright along the Wabash. Changing at Chi, met several of the boys, including Arvid Lundell of Michigan Tool and Harry Gotberg of Colonial Broach. First time I've met Harry, although we live within a city block of one another. Such is life in the city!

Thursdayed with the Directors, Bill Smila or Joe Siegel — forgot which — proxying for Don Flater. (Come up and see us sometime, Don). As usual, Nine-old-men-in-one Bob Lippard stole the show with Const'n & By-laws. Bob has a genius for making the simplest propositions sound profound and complex, although Steelman Frederick seemed to have most of the answers in his little blue book. Be that as it may, Bob won by a split infinitive, whatever that is. Or ain't it?

Read my report and took my bow along with the rest of the Committee heads; that off my mind, settled down to watch the solons at work. Sketched a pic of Gene Bouton — a honey! Tried one of John Lindegren, but couldn't do justice to his smoother profile. Missed Deacon Sprott, but renewed acquaintance with several of the "out yander" boys, including Red Cole and Bill Asmus of Texas and California, respectively.

Paul Frankfurter sold Philadelphia as the seat of the next Annual, promised the boys everything!

▲ ▲ ▲

As you know, Ray Morris, Doug Burnside and Clete Briner came in one, two, three in the election of officers, proof of fine discernment on the part of the Nominating Committee, also, proof that the Directors know a good slate when they see it.

It's my hunch that Ray is going to make a fine Prex, and the same holds true for Doug and Clete when their turns come. Ray has achieved success in the business world, while Doug is destined to go places in industry. Quick and sure in decision, he has evinced unusual executive ability. I have equal faith in Clete Briner who, earnest and sincere, is a logical thinker with all the qualities of constructive leadership.

Earl Johnson, who succeeds the energetic Clyde Hause as Nat'l Secy., is a veteran in A. S. T. E. Committee work, as is Floyd Eaton, new guardian of the Treasury. All told, the Big Five should make a finely balanced Exec. Com'tee. Ade Potter was reappointed Exec. Secy. — a deserved recognition — showing that virtue sometimes has other rewards than its own.

Frank Crone, retiring Treas., was presented with a plaque and a fine watch in token of his long years of service; behind the gift was the appreciation and good fellowship of the entire Society. You've earned a rest, Frank.

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The Mach. & Tool Progress Exhib. was tops! A big hand for Larry Radermacher and his co-workers for a swell job of arrangement. Ade Potter, too, can take a bow, the guy having done a lot of behind-the-scenes work that the rest of us don't know anything about.

The exhibits were varied, interesting and educational, and it's a foregone conclusion that both the exhibitors and the war program will benefit mightily because of the Show.

The technical sessions, too, were packed, attesting to the seriousness of the attending tool engineers and their eagerness to absorb as well as disseminate ideas applicable to increased production. Yes, the Show was a success.

Can't begin to put down all the people I met. Was luncheon guest of Len Singer and had ditto invite from Al Sargent, whose ultra-modern engineering offices I've yet to visit.

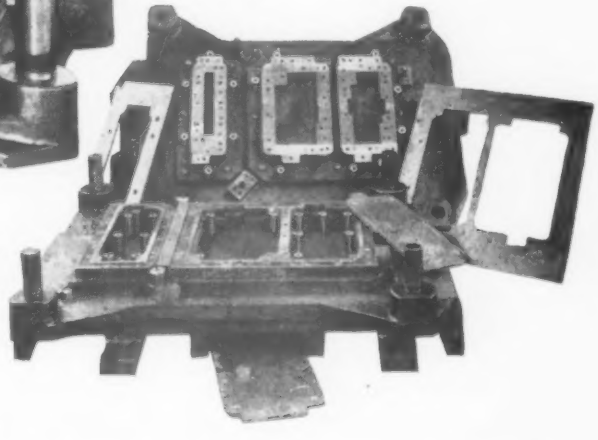
Saw Geo. Keller, who was resting his dogs after making the rounds, and come back home, Mel Kordenbrock said he spoke to me at the Show. I remember now! — it was just when Bill Fors nearly knocked me for a loop, scrambling my notes. Let's see, now . . . . Joseph Smith on stock, 530 gr. hollow base & 55 gr. pdr. — no, that refers to a gun. Thought at first it was

(Continued on page 198)

Why thousands of
WALES STRIPPITS
(SPRING STRIPPER UNITS)
are used by Tool Engineers

Left—Showing Wales Strippits in die. Note simplicity and compactness of die made possible by using Strippits.

Below—Showing punch and die equipped with Wales Strippits. Orderly arrangement is permitted by uniform pressure of same length Strippits.



Hours of die making time are saved with Wales Strippits by eliminating stripper bolts, grinding springs, boring spring pockets, and drilling and counterboring for stripper bolts.

Only Wales Strippits provide the following advantages:

1. Removing and replacing any stripper plate without disturbing the set-up.
2. Replacing broken or dulled punches is also quickly and easily accomplished without disturbing the die set.
3. Assuring even pressure over entire stripper plate.
4. Using thinner, less expensive stripper plates.
5. Eliminating stripper plate for stripping scrap from die.
6. Designing more compact punch holders and die shoes for more economical and simplified patterns.

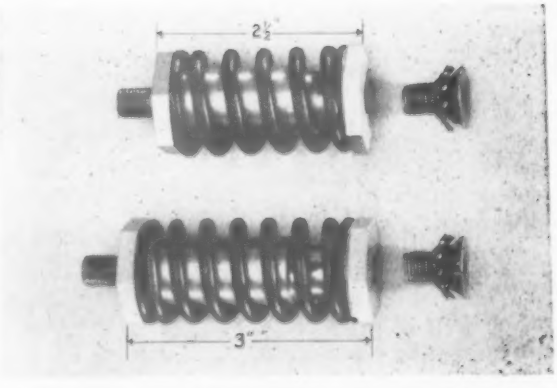
Wales Strippits are available in 2½" to 6" lengths.

IMMEDIATE DELIVERY

on popular 2½" and 3" lengths.

Wales Strippits are self-contained, self-aligning units with built-in spring held compressed by retainer and assembly link which exert pressure on stripping plate only when die is punching. Be prepared by having a stock of Wales Strippits on hand. They can be used on old dies, too! Wales Strippits are surprisingly inexpensive!

Remember, "There's Always Something New in the Wales Line" —so keep posted by writing NOW to—



Above—Showing 2 Wales Strippits with screw threads that hold Strippit to punch or die shoe and other end with tapped hole and screw to hold stripper plate to Strippit.

WALES-STRIPPIT CORPORATION
(FORMERLY THE STRIPPIT CORPORATION)
NORTH TONAWANDA, N. Y.
GEORGE F. WALES, President

Specialists in Punching and Notching Equipment

(Concluded from page 196)

someone from Salt Lake City. But I saw Al Mitchell and Steve Urban from Syracuse, and Gene Marriote, with whom I sent back regards to Prof. Bull of Syracuse U. (You'll hear from me again, Prof.) Of the Hounds, only three members present, Gardner Young, W. B. (Slim) McClellan and yrs. Truly.

Met John Geddes of Boston, asked him to remember me to my hosts of last October. Hobnobbed a bit with the California contingent, including Art Denis, Bob Garwood and Jack Marvin, also got better acquainted with Karl Bues of Oakland.

Was told that 1200 sat down to banquet, but it petered down to a mere 750 —but that's a lot! Ran into Rip Collins of Houston just before dining, laughed myself sick at his hillbilly story. (Any old guns down your way, Rip? — say one with a lot o' notches on it.) Got Chris Vogt, Ralph Hammond and Bill Addis, along with Red Cole and Rip, in the same bracket which happens to be a pair of bowlegs with fringes on the side — chaps y'know — so naturally consign the quintette to Texas.

I see that Fred Schytte is missing, but I've got down Dave Forsman, Vic. Ericson and Ade Potter, who can say skoal. And I met Oscar Theander, who introduced me to his big young brother and his vivacious little sis-in-law. Skoal, pojkar!

Retiring Prex Ot Winter introduced celebrities during the banquet, rattled off sections like a veteran station master.

Otto also did himself proud when he publicly acclaimed his charming young wife as the power behind the presidential chair. Well, many a wife plays her role unsung, but plays it exceedingly well regardless.

Brig. Gen. H. F. Safford, Chf. of Prod'n. Service, Ordnance, spoke on the Application of Tool Engineering to War Production.

Tool Engineers have unanimously rallied behind Uncle Sam for the biggest production in world history, have been just too busy getting things done to beef about petty annoyances. But then, hard work merits its diversions, as, for example, the floor show that capped the banquet.

▲ ▲ ▲

Yes, the Convention was tops, and Milwaukee's a swell town. One thing, I'm wondering if they have any safety inspection in the town. Nary a one of the elevator operators at the Schroeder closed the safety door on the lifts, and it would have been just too bad if anyone had been jostled to the opening as the cars hurtled up and down.

Had a little trouble getting bedded down, the room clerks somehow having expected everybody "yesterday". However, allowances must be made for wartime and reduced staffs.

Now, for six months of the daily grind, when we meet in Indianapolis next October.

▲ ▲ ▲

Well, conventions are okay, especially when dedicated to the country's security, as most engineering meetings are. At these meetings, we discuss the ways of doing, with lighter diversions spare time incidentals rather than objectives.

Yet, the immediate beneficiaries are those who can attend — usually but a small minority in a Society as big as the A.S.T.E. This disparity, however, need not preclude the stay-at-homes, since all of the pertinent topics of discussion are published in THE TOOL ENGINEER.

Now, certainly, the government admits the importance of engineering conventions, encourages them by sending ranking naval and military leaders as guest speakers. The value of engineering, and the engineer's place in war, is frankly conceded.

Why, then, the utter incongruity of encouraging conventions, the while restricting the publication of engineering and industrial news by the rationing of paper?

Understand, now, I'm speaking as an individual, with no particular axe to grind, except as it hews to the line. But, the object of rationing is to conserve, or to cover a shortage, and I'm danged if I can concede a shortage of paper when the accumulations in our basements and garages go begging, and when it's a weekly chore to gather and burn the bushels of handbills and newsprint that swirl into our yards with each vagrant breeze.

Besides, it costs about twice as much for the thinner paper, and more to print it, so where is the conservation? No doubt one of the Great White Father's brain trusters can answer that question.

THE END.

A. S. T. E. DOINGS

Binghamton. The April 7 dinner and meeting attracted 61 members and guests. Speaker at this meeting was Mr. C. M. Ripley of the General Electric Company. Mr. Ripley spoke on the subject "Power for War."

Mr. Ripley also conducted a game in which those taking part paid 50c to guess the weight of a Dow Metal ring and a Carboloy disc. The Winner was awarded a $25 War Bond.

Boston. Ray Morris, national president, was a guest at the April 8 meeting and gave a brief talk on the Milwaukee convention.

Two gadget talks were given. Walter Trask of General Electric's Everett supercharger plant and George M. Mason from the Neilan Regulator Company at Milton told about gadgets they had designed.

Principal speaker at this meeting was Mr. James Beard of Socony Vacuum Oil Company. Mr. Beard spoke on "Fluids for Metal Cutting."

Bridgeport (Fairfield County). Prior to the regular business meeting on March 10, dinner was served at the University Club for the guests and officers only.

The business session was held at the Hotel Stratfield and the new chapter officers were installed. The committee chairmen chosen at this meeting included Mr. A. S. Curry, program; Mr. C. Christenson, membership; Mr. J. O'Brien, entertainment; Mr. V. V. Koodroff, standards and technical; Mr. J. Billingsley, constitution and by-laws; and Mr. C. J. Gluck, educational.

Mr. Philip McKenna, head of the McKenna Metals Company was the speaker of the evening. Mr. McKenna illustrated his lecture with moving pictures of tungsten carbide tipped tools in operation and slides on the making of tungsten carbide tipped tools.

Buffalo. Otto W. Winter, immediate past national president, administered the oath of office to the new officers at the April 15 meeting. Mr. Winter also presented Wm. J. Gamble with a diamond past chairman's pin.

Cecil G. Lucas was present at this meeting and gave a brief talk on the duties of the regional director. He also presented the new chairman with a chairman's pin. George Keller was in charge of the entertainment for this meeting.

Chicago. The April 5th meeting of the Chicago chapter marked the transfer of leadership to the new officers. Chapter Chairman Roy Hoefer presented his pin and seal to Frank Martindell, the new chairman, and in return received a past chairman pin in recognition of his service.

Members appointed to the various committees for the coming year included W. F. Ardussi and J. R. Miller, meetings; H. R. Nelson, standards, R. R. Hoefer, industrial relations; F. A. Armstrong, membership; C. C. Waldo, educational; F. M. Kincaid, by-laws; H. R. Ball, notices; B. Brosheer, publicity; and B. S. Nelson, editorial.

Mr. A. G. Mather, president of Do-All Midwest Company was the after-dinner speaker. Mr. Mather's subject was "The Continental Process."

Cincinnati. More than eighty members attended the April 13 meeting which featured an address by Mr. Peter F. Rossman, technical assistant of the Curtiss-Wright Corporation, Airplane Division, Buffalo, New York. Mr. Rossman spoke on the design of tools and dies used in aircraft manufacture.

Installation of new officers followed

(Continued on page 202)

an address by retiring chairman Mr. A. C. Pletz. The newly elected officers included Mr. Carl Flick, chairman; Mr. Frank Rippl, first vice-chairman; Mr. Donald Nerswick, second vice-chairman; Mr. Edward H. Bohnenkamp, treasurer; and Mr. C. W. Stricker, secretary.

Cleveland. The Mid-Day Club was the scene of the March 13 meeting which was attended by approximately seventy-five members and guests for the dinner and more than a hundred at the technical session which followed.

The retiring chairman, Charles W. Scheihing, gave a short talk and turned over his gavel of office and chairman pin to C. V. Briner. Mr. Briner introduced and administered oath of office to the new officers. The new chapter officers include William Reiff, Jr., chairman; J. K. Fitzgerald, first vice-chairman; J. I. Karash, second vice-chairman; R. H. Alexander, secretary; and K. H. Meyer, treasurer.

Technical speaker at this meeting was Karl H. Keller, industrial control specialist of the General Electric Company. Mr. Keller spoke on the subject, "Electronic Controls As Applied to Machine Tools."

Columbus. New committee chairmen were installed at the April 13 meeting which was held in the Blue Room of the Hotel Fort Hayes. The heads of the various committees include H. P. Spoerlein, meetings; E. J. Lowry, industrial relations; E. C. Hanna, entertainment; E. W. Siegel, publicity; S. M. Mack, membership; T. F. Starkey, editorial; R. J. Freter, standards; V. Blasutta, constitution and by-laws; and J. N. Edmondson, educational.

Mr. S. J. Klein, chief engineer of the Castaloy Corporation, was the speaker at this meeting. Mr. Klein was assisted by Mr. F. H. Lowry, general sales manager of his concern and presented an illustrated talk on "Castaloy Method in Aircraft Tooling."

Ed Lowry gave a short report on a meeting he attended at Ohio State University relative to a council of all technical societies in Columbus.

Left to Right: Paul Rossbach, C. V. Briner, Rudy Fintz, C. W. Scheihing and G. J. Hawkey received Past Chairman's pins at recent Cleveland meeting.

Dayton. Retiring chairman Howard MacMillan administered the oath of office to new chapter officers at the April 12th meeting. New chairman, Jack Blair, presented the chapter's past chairmen, Earl Johnson, George Goodwin, Herman Pooch, and Howard MacMillan with past chairmen's pins.

A visitor at this meeting was Mr. Otto Winter, immediate past president of the society. Mr. Winter gave a talk on the history of the A.S.T.E., its present work and its aims in the future, followed by highlights of his trip to Russia. Herman Pooch gave a report on the Milwaukee meeting.

A film and talk on Boy Scout work was presented by Mr. Joseph H. Banet, field scout executive of the Dayton Miami Valley Council Boy Scouts of America.

Decatur. Approximately 150 members and guests attended the April 7th dinner meeting of the newly organized Decatur chapter at Hotel Orlando. They heard Mr. Malcolm F. Judkins, chief engineer of Firth-Sterling Steel Company. Mr. Judkins spoke on "The Making of Sintered Carbide Tipped Tools and Their Maintenance."

W. Z. Fidler, past chairman of Tri-Cities chapter and several members of the St. Louis chapter were among the guests at this meeting.

Officers of the chapter include Edward M. Barry, chairman; Edwin W. Brown, first vice-chairman; Richard Cole, second vice-chairman; George Miller, treasurer; and Roy M. Dunn.

(Continued on page 204)

Secretary.

Detroit. The April meeting featured the installation of new officers and presentation of past chairmen's pins.

The speaker at this meeting was Lieut. Colonel J. M. Colby, Chief of the Army's Ordnance Tank Development Center. Colonel Colby spoke on "The Performance of American Tanks on the Battlefield." His remarks were based on actual observations in Egypt, India and the Middle East. The speaker was introduced by Mr. E. J. Hunt, operating manager of Chrysler's Tank Arsenal.

Fond du Lac. The April 9th meeting was Ladies Night and 78 gathered at the Takodah Club for a Smorgasbord dinner. New chapter officers were installed at this meeting.

The new chapter chairman, A. F. Schroeder, announced the new chapter committees. Gideon Kane, Miles A. Boer, George E. West, Kenneth D. Leicht, Clarence H. Pratt and Edward R. Roll comprised the membership committee. Members of other committees include E. J. Kaiser, standards; Henry S. Faith, editorial and publicity; Charles Billberg and W. E. Rutz, industrial relations; Christian W. Hansen and Marvin R. Miller, educational; W. E. Rutz, constitution and by-laws; and K. F. Gallimore, nominating.

Eugene Bouton presented the chairman's pin to Mr. Schroeder and also gave a report of the recent A.S.T.E. convention in Milwaukee. The entertainment for the evening included dancing and vocal selections by the Felten sisters.

Fort Wayne. The technical speaker at the April 14th meeting was Mr. G. B. Berlien, chief metallurgist of the Lindberg Steel Treating Company of Chicago.

A report of the Milwaukee meeting was given by Mr. A. E. Feightner, chief tool engineer of the Lima Locomotive Works, and by the chapter chairman, Mr. Cyril Grindrod.

Hartford. The newly elected chapter officers were inducted into office at the April 5th meeting. The oath of office was administered by Mr. Ray H. Morris, national president.

Speaker of the evening was J. B. Wilkie, gage sales engineer of Pratt & Whitney Company. Mr. Wilkie spoke on "Gage Practice." Mr. Charles M. Pond, vice president of Pratt & Whitney, spoke on the origin of glass gages, the various stages of progress, present status and future possibilities.

The chapter was entertained with educational movies which showed the Sikorsky Aircraft Helicopters.

Mr. I. F. Holland gave a report on the Milwaukee meeting, its show, technical sessions and the newly elected national officers.

Milwaukee. The April 8th meeting was held in the Milwaukee Boys' Trade and Technical High School. Following the dinner, the members had an opportunity to visit the various shops in operation at the school.

At 8:30 P. M. the members gathered in the auditorium where they listened to Mr. Eugene Bouton, who gave a report on the director's meeting held at the Milwaukee convention.

The speaker at this meeting was Julius Heil, former Governor of Wisconsin, who spoke on the opportunity for youth in this war and in the post-war years to follow. A movie on India was included on the program.

Moline. The Tri-Cities chapter held its April dinner meeting at the Hotel Blackhawk. Otto Reller, a past-chairman of the chapter, installed the new chapter officers for the coming year. Sigurd Lunde, retired chairman, was presented with a service plaque.

Lou Lingler, Sheffield Gage Corporation, of Dayton, Ohio, was speaker for the technical portion of the program. In speaking on "Dimensional Control", he compared the gaging methods of the last war with those of the present war.

Minneapolis-St. Paul. The April 14th meeting of the Twin Cities Chapter was held in the banquet hall of the Y.M.C.A. in Minneapolis. Chapter Chairman Francis E. Gruber gave a report on the Tool Engineers show held in Milwaukee.

At the technical session brief talks were made by various chapter members. A sound film entitled "We Work for Victory and Plan for Peace" was shown

(Continued on page 206)

through the courtesy of the Allis-Chalmers Company.

New Haven. The April 1st meeting was held in the Garde Hotel with Chairman Dawless presiding.

The speaker at the technical session was Mr. Frank O. Hoagland of Pratt & Whitney. Mr. Hoagland spoke on "Jig Boring Operations and the Solution of Attending Problems."

New York. The April 5th meeting was held in the North Ballroom of the Hotel New Yorker. The program included a film shown by Lindberg Engineering Company and entitled "Second Edition of Heat Treating Hints."

Newark. The technical speaker at the March 9th meeting, held at the Hotel Robert Treat, was Mr. Charles Pfeffer, Production Engineering Department of Wright Aeronautical Corporation. Mr. Pfeffer spoke on the manufacturing and construction of aircraft gears.

New chapter officers were sworn in by Mr. Charles Thomson.

Chairman Masters of the membership committee reported that 27 new members had been accepted by the executive committee in January.

Peoria. The dinner of the April 6th meeting was followed by installation of new officers which included Van Wilder Joslin, chairman; C. B. Hartsock, first vice-chairman; Stanley Aldred, second vice-chairman; Herman Krei, secretary; and Charles Lipp, treasurer.

This meeting was held at the Creve Couer Club and Mr. J. Gilchrist, regional director gave the executive committee's report.

Guest speaker at this meeting was Mr. Louis Lingler of the Sheffield Corporation. Mr. Lingler spoke on "Dimensional Control by Precision Gages."

Philadelphia. The April 15th meeting held at the Engineers Club at Philadelphia was designated as R.C.A. Night.

Following dinner, a sound motion picture was shown entitled "Electrons On Parade." The technical speakers at this meeting were Mr. R. A. Bierwirth and Mr. C. N. Hoyler of the R.C.A. Laboratories. They talked on "Radio Frequency Currents."

Pittsburgh. The April 9th meeting was held at the Fort Pitt Hotel with 172 members and guests present at the technical session.

Mr. H. M. Huffman, field engineer for Cincinnati Milling & Grinding Machines, Inc., was the speaker at this meeting. Mr. Huffman talked on the subject of "Cutter Sharpening Practice" and illustrated his talk with numerous slides.

The new chapter chairman, Mr. Gardner Young, presided at this meeting and a report was given on the Milwaukee Convention.

Providence. The principal speaker at the April 26th meeting of the Little Rhody Chapter was Capt. W. C. Swartley, of the Boston Ordnance District. Capt. Swartley spoke on "This Business of Ordnance."

The meeting was held at Howard Johnson's Restaurant and Mr. E. H. Fernald of the Industrial Plating Company, Graystone, Rhode Island was the coffee speaker. Mr. Fernald spoke on "High Lights of Chrome Plating." A sound film was also shown at this meeting entitled "The Tanks Are Coming."

Rochester. The monthly meeting, preceded by dinner at Todd-Union, was held April 16th in the Lower Strong Auditorium of the University of Rochester. Approximately 125 members and guests listened to Mr. I. T. White of the Warner & Swasey Company, Cleveland, give a talk on tooling and operating Turret lathes.

In the absence of chairman Schick, first vice-chairman, Chauncey Newman conducted the meeting. The annual bowling party of the chapter was held on the same evening at the Eagles Hall and was attended by over 300 members and friends. A score of 193 won the bowling prize and over 50 door prizes were contributed by local industries.

A meeting of the board of directors was held at the Hotel Sagamore on April 12. Thirty-three members of the Rochester chapter attended the annual meeting at Milwaukee.

St. Louis. "The Tocco Process of Induction Heating" was the subject pre-

(Continued on page 208)

sented by Dr. H. B. Osborn, Jr. at the April 1st meeting held at the Hotel Melbourne. Dr. Osborn is in charge of development and research of the Tocco Division of The Ohio Crankshaft Company.

Two hundred and twenty-five members and guests were present at this meeting and heard John Gilchrist, regional director, and D. D. Burnside, national first vice-president, report on the National Convention.

San Francisco. The Golden Gate Chapter held its regular monthly meeting on March 15th at the Engineers Club in San Francisco attended by one hundred and two members and guests. During the coffee hour a sound film was shown on the tipping of cutting tools with salvaged high speed steel. The film was furnished by the Timken Roller Bearing Company of Canton, Ohio.

Mr. Fred Bonte, development engineer of the Timken Roller Bearing Company, was the principal speaker of the evening. Mr. Bonte talked on "Graphitic Steels and Their Application for Tool and Die Shops and Metal Working Industries."

Mr. Bermingham, chairman of the Golden Gate Chapter of the Society of Metals was introduced at this meeting and gave a brief talk inviting members to attend a series of five lectures on metallurgy and substitute steels to be given in San Francisco during May.

Past chairman, Karl Bues, gave a brief talk on the talent survey being conducted by the A.S.T.E.

Schenectady. W. A. Nelson of the General Electric Company was installed as chapter chairman by F. J. Diehl, regional director, at the April 8th meeting held at the Masonic Hall, Scotia. Other officers installed at this meeting included Mr. C. J. Sertl, first vice-chairman; F. J. Lineham, second vice-chairman; C. E. Smart, third vice-chairman; N. Y. Coxe, secretary; and R. H. Wilkie, treasurer.

Sixty-five members attended the dinner and meeting and heard R. S. Brandenburg of the Monarch Machine Tool Company. Speaking at the technical session, Mr. Brandenburg, presented an illustrated lecture on two new developments. One pertained to the turning of an irregular cross section fluted mold for molding glass and the other an electrical control for contour turning to a template on lathes.

Dr. R. P. Reid, Red Cross official explained the activities of the nation-wide blood drive. Dr. Reid also presented a color motion picture on "Liberty's Life Stream."

South Bend. Mr. Stanley Cope, past chapter chairman, took charge of the installation ceremony of new chapter officers at the April 13th meeting. The new officers included Frank Foote, chairman; William Wolf, first vice-chairman; Arthur Regan, second vice-chairman; Clark Zesinger, treasurer; and Fred Burnside, secretary.

Mr. H. R. Wentzell, regional director, gave a report on the annual meeting at Milwaukee.

Included in the program was a picture

(Continued on page 210)

shown by Allis-Chalmers Company entitled "We Work for Victory and Plan for Peace."

Springfield, Vermont. The April 8th meeting of the Twin States Chapter was held at the Masonic Temple with ninety-eight members present for the dinner.

The speaker at the technical session was Mr. George H. Sanborn of the Fellows Gear Shaper Company. Mr. Sanborn spoke on "Gears at War." He told about the various types, sizes, and mentioned interesting as well as unusual applications in various plants throughout the country. A considerable portion of the session was devoted to the flame hardening process as applied to gears.

A technical film, "There's a Job to be Done," was shown. This film showed the various steps in producing alloy steel in the plant of the Allegheny-Ludlum Steel Company.

Syracuse. The March 9th meeting was held at the Syracuse Industrial Club with sixty members attending the dinner and over one hundred the technical meeting which followed. Ray Wands introduced Mr. Francis Savage and Carl Doman of Aircooled Motors Corporation, who were the technical speakers at this meeting. They talked on "The Future of Aircraft and the Responsibility of the Tool Engineer."

Members also saw at this meeting a moving picture on the Syracuse foot-ball games which was accompanied by a running comment by Bill Lannon, of the Syracuse coaching staff.

Toronto. New chapter officers were installed at the April meeting. Mr. Mayo of the Brown & Sharpe Mfg. Company was the speaker at this meeing.

A color film was shown at this meeting entitled, "Vision Fulfilled."

Washington, D. C. The April 1st meeting was the First Annual Ladies Night of the Potomac Chapter and was held at the Harrington Hotel. Approximately one hundred were present for the turkey dinner. The speaker of the evening was Mr. Guy Hottel, Special Agent, Federal Bureau of Investigation. Mr. Hottel spoke on "Un-American Activities in our War Effort."

Pictures were shown at this meeting through the courtesy of the Navy Department. Music for dancing followed the pictures.

Wichita. The April 13 program featured three pictures on metal forming, rolling and blanking released by the Navy. M. M. Ross gave a short talk on the fabrication and uses of glass gages.

Worcester. The speaker at the technical session of the April 13th meeting was Mr. Frank W. Curtis, Chief Engineer of the Van Norman Machine Tool Company and a past national president of the A.S.T.E. Mr. Curtis spoke on the future possibility of induction heating.

Mr. Henry Wilder, new chapter chairman took over the chairman's duties and conducted this meeting. Mr. C. J. Lindegren presented Mr. Wilder with a chairman's pin.

THE END.

THE PASSING PARADE *

THE EVER-CHANGING SCENE IN MASS MANUFACTURING

*T.M. REG. U.S. PAT. OFF.

Emil T. Johnson, formerly works manager of the Lycoming Division of The Aviation Corporation at Williamsport, Pennsylvania, has been promoted to the position of plant manager according to a recent announcement. **Herbert J. Glasby** succeeds Mr. Johnson as works manager.

Dr. Irving Langmuir, associate director of the General Electric Research Laboratory, has been elected to honorary membership in the Institute of Metals of London.

John R. Ritzinger has recently been appointed chief engineer of Pal Blade Company's plants, including the Pal Cutlery Division at Holyoke, Massachusetts, the Pal Blade plant at Plattsburgh, New York and the Pal Blade plant at Montreal, Canada. Formerly with the Mattatuck Manufacturing Company at Waterbury, Connecticut as plant engineer, Mr. Ritzinger is a member of the American Society of Tool Engineers.

Neil C. Hurley Jr. was elected executive vice-president of the Independent Pneumatic Tool Company at a recent meeting of the Board of Directors. Mr. Hurley has been associated with the company for eleven years.

William F. Wise, executive vice-president of Aviation Corporation of Detroit and president of American Propeller Corporation of Toledo, was recently made a director of the National Tool Company of Cleveland. **Edward G. Hardig** was appointed sales manager of the company.

Bradford B. Mills, is now the service representative for Putnam Tool Company of Detroit in the New England area. Mr. Mills has his headquarters in New Haven and has spent 10 years in

(Continued on page 214)

JOINS A.S.T.E. STAFF

Bramson Publishing Company Photo

As we go to press, we have received the following statement issued by Adrian L. Potter, Executive Secretary of the American Society of Tool Engineers:

"It is with regret that we announce to their many friends in the membership of ASTE the resignations of Howard Handyside, as Office Manager, and Frank Quigley, Membership Supervisor. Both of these young men are entering war production industry.

"Mr. Howard M. Witt assumed duties as assistant to the Executive Secretary on April 16th. Mr. Witt brings with him a long experience in association activities and in industry."

——PASSING PARADE——

that area in the small tool industry.

Fred G. Howell, formerly branch manager of the Detroit branch of the Producto Machine Company, was recently appointed vice-president of the Producto Corporation.

Dr. Robert V. Yohe, technical superintendent of the chemical division of The B. F. Goodrich Company, was recently named plant manager of the government synthetic rubber plant operated by the Goodrich Company in Kentucky.

A. L. PATRICK
Now Camco Board Chairman.

A. L. Patrick, retiring president of the Cleveland Automatic Machine Company, has taken over the duties as Chairman of the Board. **Col. James Hammond,** formerly Chairman of Board of the company, was elected president and treasurer. **G. V. Patrick** was named executive vice-president.

FRANK J. COUGHLIN
Heads purchasing at P. & W.

Frank J. Coughlin was recently appointed as the Pratt & Whitney purchasing agent. Mr. Coughlin has been with the company thirty years and has been assistant purchasing agent since 1928.

John A. Elmes, formerly chief engineer of the Keystone Driller Company at Beaver Falls, Pennsylvania, was recently appointed plant manager of the Jones Engineering Company at Ellwood City, Pennsylvania.

L. M. Harris was recently appointed general sales manager of the Park Chemical Company, Detroit.

Charles L. Glaes was recently appointed production manager of the four footwear plants of United States

(Continued on page 216)

Rubber Company. Mr. Glaes has been with the company for 26 years.

HELGE G. HOGLUND
Van Norman vice-president.

Helge G. Hoglund, sales manager of the Machine Tool Division of Van Norman Machine Tool Company for the past ten years, was recently appointed vice-president of the company. Mr. Hoglund will continue to be in charge of the sales of the Machine Tool Division and in addition, he will have control of sales of the new Electronics Division of the company.

HENRY J. RICHARDS
Now at G.E. River Works.

Henry J. Richards, chief inspector of the Everett Supercharger plant of the General Electric Company, was recently made assistant superintendent of inspection at the River Works of the General Electric Company. Mr. Richards is the first vice-chairman of the Boston Chapter of the American Society of Tool Engineers.

Bernard N. Brockman was recently made vice president and general manager of The R. K. LeBlond Machine Tool Company, Cincinnati. For the past eight years Mr. Brockman has been in charge of the Company's Chicago office.

Carl W. Horack recently resigned from the Merco-Nordstrom Valve Co. Oakland, California, to accept a position with the Joshua Hendy Iron Works of Sunnyvale, California, as tool engineer. Mr. Horack has been a member of the American Society of Tool Engineers since 1935 and served as the first chairman of the San Francisco-Oakland chapter.

John Rosevear was recently named manager of the new Fairmont, West Virginia works of the Westinghouse Electric & Manufacturing Company. Other new personnel changes recent-

(Continued on page 218)

ly announced by Westinghouse include the appointment of **C. H. Weaver** as manager of the Marine Section of the Industrial Department. He succeeds **J. R. Fulton**, who has been appointed assistant to the manager of the company's Industrial Department. Another appointment was that of **Dr. Charles M. Slack**, physicist, and assistant director of research at the Westinghouse Lamp Division, Bloomfield, New Jersey.

HARRY H. DE LOSS
Handy & Harman director dies.

C. W. Higbee has been made manager of the newly organized wire and cable department of United States Rubber Company.

Ellsworth Brash, III was recently appointed district representative for

(Continued on page 220)

the Allen Manufacturing Company in Pennsylvania and New York State, except greater New York and Long Island.

Norman F. Smith, vice-president and general manager of the Osborn Manufacturing Company of Cleveland, was elected president of the American Brush Manufacturing Association at the 26th annual convention of the organization.

DIED

Harry Herbert De Loss, a director of Handy & Harman, New York, died March 28, at Clearwater, Florida. Mr. De Loss joined the Handy & Harman organization in 1900 when the Standard Metal Company of Chicago, of which he was the principal owner, was absorbed by Handy & Harman. Mr. De Loss served in the capacity of vice-president in charge of manufacturing for many years and was treasurer of the company from 1905 to 1915. From 1915 to 1923 he was vice-president and was a director of the company from 1905 until his death.

Arthur Livingstone Kimball, research physicist and consulting engineer of the General Electric Company died recently at his home in Schenectady, New York. He was 57 years old at the time of his death. Mr. Kimball was a graduate of Amherst College and Harvard Engineering School. Mr. Kimball entered the employ of General Electric Company in 1918 as engineer in the research laboratory.

H. F. T. Erben, former manager of the General Electric Schenectady works, died in Ellis Hospital at Schenectady April 8. He was 77 years old at the time of his death. Mr. Erben graduated from Stevens Institute of Technology in 1887 and entered the employ of the Edison Machine Works in Schenectady, forerunner of General Electric. He was designing engineer of General Electric's direct current department and in 1914 became engineer of the Schenectady works. Two years later he was promoted to assistant works manager and in 1920 became works manager. In 1924 he was named assistant to the vice-president attached to the general manufacturing department. THE END

MAY MEETINGS

CINCINNATI — May 15. Hotel Alms Ballroom. Fifth Annual Dinner Meeting. The speaker will be Mr. Tell Berna, general manager of the National Machine Tool Builders Association. Subject — "The Outlet for the Machine Tool Industry in War and Peace."

CLEVELAND — May 14. Dinner: 6:30 P. M., Technical Session: 8:00. Mid-Day Club. Speaker will be J. B. Wilkie of Pratt & Whitney. Subject— "The Latest Developments in Gage Engineering." Reservations: Bob Alexander at Henderson 4190.

HAMILTON — May 14. 7:00 P. M. Royal Connaught Hotel. Speaker will be Albert M. Johnson, president of the Barnes Drill Company. Subject — "Why's and How's of the Honing Process."

SYRACUSE — May 11. 8:30 P. M. Hotel Syracuse. Speaker will be Mr. S. A. Brandenburg. Subject — "The Monarch Keller Contour Turning Machine Tool in Present Day Industry."

WASHINGTON, D. C. — May 12. Sapphire Room of the Mayflower Hotel. Spring Dance, semi-formal.

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Abrasive Machine Tool Co. 190
Acme Industrial Company 207
Acme Machine Tool Co., The 146
Aero Tool Company 42
Aero Tool & Die Works 221
Ajax Steel & Forge Co. 219
Allen Mfg. Co., The 138
Amco Gage Co. 218
American Broach & Machine Co. 175
American Cutter & Engineering Corp. 205
American Designing & Engineering Co. 152
American Screw Products 8
American Swiss File & Tool Co. 210
Ames, B. C. Co. 158
Ampco Metal, Inc. 186
Andersen Bros. Mfg. Co. 136
Apex Machine & Tool Co., The 157
Armstrong-Blum Mfg. Co. 160
Armstrong Bros. Tool Co. 222
Atlas Press Co. 223
Baker Bros., Inc. 23
Baldor Electric Co. 225
Barber-Colman Co. 46
Barnes Corp., John S. 152
Barnes Co., W. F. and John 32
Barnes Drill Co. 148
Bartelt Engineering Co. 217
Bay State Abrasive Products Co. 195
Blake Company, Edward 142
Blanchard Machine Co., The 117
Boggis & Co., Henry P. 222
Bokum Tool Company 211
Boyar-Schultz Corp. 199
Bradford Machine Tool Co., The 188
Brewster-Squires Co. 207
Brown Corp., W. R. 140
Brown & Sharpe Mfg. Co. ..... 3rd Cover
Bryant Chucking Grinder Co. 113
Bryant Machinery & Eng. Co. 45
Buhr Machine Tool Co. 115
Carboloy Co., Inc. 103
Carborundum Co., The 167
Carlton Machine Tool Co., The 199
Carpenter Steel Co., The 139
Cerro De Pasco Copper Corp. 201
Chambersburg Engineering Co. 147
Chicago Pneumatic Tool Co. 50
Chicago Rawhide Mfg. Co. 205
Chicago Tool & Eng. Co. 215
Chicago Wheel & Mfg. Co. 15
Cincinnati Grinders, Inc. 120
Cincinnati Shaper Co., The 125
Circular Tool Co., Inc. 206
City Engineering Co., The 53
Clereman Machine Tool Co. 45
Cleveland Automatic Machinery Co., The 13
Cleveland Pneumatic Tool Co., The 60
Cleveland Twist Drill Co., The 36
Colborne Mfg. Co. 211
Columbia Tool Steel Co. 215
Comtor Co., The 209
Cone Automatic Machine Co., Inc. 39
Cooper-Bessemer Corp., The 122
Copperweld Steel Co. 35
Coulter Machine Co., The James 218
Cullen-Friestedt Co. 223
Cullman Wheel Co. 215
Cushman Chuck Co., The 182
Danly Machine Specialties, Inc. 56
Davis Boring Tool Division 21
Davis & Thompson Co. 119
Delta Mfg. Co., The 177
deSanno & Son, Inc., A. P. 43
Despatch Oven Co. 144
Detroit Broach Co. 114
Detroit Power Screwdriver Co. 142
Detroit Stamping Co. 213
Detroit Tap & Tool Co. 171
Detterbeck Co., George L. 207
Diamond Tool Co., Not Inc. 225
DoAll Co., Inc. 27
Douglas Machinery Co., Inc. 162, 209, 220
Dremel Mfg. Co. 130
Eastern Cutter Corp. 155
Egyptian Lacquer Mfg. Co. 126
Ettco Tool Co., The 162
Evans Flexible Reamer Corp. 209
Everede Tool Co. 225
Ex-Cell-O Corp. 17
Experimental Tool & Die Co. 209
Federal Products Corp. 111
Federal Tool Corp. 203
Firth-Sterling Steel Co. 33
Fray Machine Tool Co. 217
Gairing Tool Co. 40
Gallmeyer & Livingston Co. 136
Galter Mfg. Co. 154
Gammons-Hoaglund Co., The 134
Garrison Machine Works, Inc. 225
Giddings & Lewis Machine Tool Co. 10
Giern & Anholtt Tool Co. 221
Gilmore Co., F. F. 192
Gisholt Machine Co 19
Glenzer Co., The J. C. 160
Gorton Machine Co., Geo. 29
Graham Mfg. Co., The 138
Grayson Mfg. Co. 151
Greenfield Tap & Die Corp. 66
Greenlee Bros. & Co. 129
Grob Brothers 223
Hammond Machinery Builders, Inc. 203
Hanna Engineering Works 158
Hannifin Mfg. Co. 64
Hardinge Bros., Inc. 131
Hartford Special Machinery Co., The 203
Haskins Co., R. G. 213
Haynes Stellite Co. 47
Heald Machine Company, The 14
Hecker, A. W. 16
Hill Acme Co., The 185
Hobart Bros., Co. 136
Hole Engineering Service 138
Hole-Krome Screw Corp., The 2
Hydraulic Machinery, Inc. 193
Independent Pneumatic Tool Co. 137
International Machine Tool Corp., Foster Div. 11
International Machine Tool Corp., Libby Div. 49
International Nickel Co., Inc., The 135
Jansson Gage Co. 211
Jarvis Co., The Chas. L. 31
Johnson Gas Appliance Co. 224
Jones & Lamson Machine Co. 8
Kearney & Trecker Prod. Corp. 5
Knight Machinery Co., W. B. 200
LaSalle Designing Co. 180
Leach Machinery Co., H. 215
LeMaire Tool Co. 181
Lewthwaite Machine Co., T. H. 221
Liberty Tool & Gage Works, Inc. 204
Lima Electric Motor Co., The 196
Lincoln Park Tool & Gage Co. 161
Lodge & Shipley Machine Tool Co., The 123
Logansport Machine, Inc. 18
Lombard Governor Corp. 156
Lovejoy Tool Co., Inc. 169
Lufkin Rule Co., Inc. 226
Macklin Co. 228
Madison-Kipp Corp. 20
Martindale Electric Co., The 219
Master Chrome Service, Inc. 155
Matthews & Co., Inc., Jas. H. 162
Mattison Machine Works 52
McCrosky Tool Corp. 178
McGowan Engineering Service 221
McKenna Metals Co. 176
McKinney Tool & Mfg. Co. 208
Mead Specialties Co. 221, 225
Michigan Tool Co. 196
Micromatic Hone Corp. 132
Midwest Tool & Mfg. Co. 22
Monarch Machine Tool Co., The 26
Monarch Steel Co. 128
Morse Tool Co. 158
Morse Twist Drill & Machine Co. 161
Motor Prod. Corp., Deepfreeze Div. 143
Murchey Machine & Tool Co. 28
National Acme Co., The 24
National Broach & Machine Co. 6
National Tool Co., The 201
National Tool Salvage Co. 140
Niagara Machine & Tool Works 150
Nielsen, Inc. 211
Ohio Crankshaft Co., The 38
OK Tool Co., The 146
O'Neil-Irwin Mfg. Co. 216
Onsrud Machine Works, Inc. 173
Oster Mfg. Co., The 63
Ott Machinery Sales, Inc. 223
Ozalid Products Div. 39
Parker-Kalon Corp. 179
Physicists Research Co. 227
Pioneer Pump & Mfg. Co. 174
Pipe Machinery Co., The 37
Potter & Johnson Machine Co., The 31
Pratt & Whitney Div. ..... 2nd Cover
Preis Engraving Machine Co., H. P. 221
Procunier Safety Chuck Co. 220
Producto Machine Co., The 194
Putnam Tool Co. 156
Quality Tool & Die Co. 118
Racine Tool & Machine Co. 145
Ransome Machinery Co. 214
Ready Tool Co., The 217
Rehnberg-Jacobson Mfg. Co. 198
Reliance Electric & Engineering Co. 199
Robbins Engineering Co. 212
Roberts Rubber Co., Weldon 222
Ruthman Machinery Co., The 219
Sav-Way Industries 62
Schauer Machine Co., The 207
Scherr Co., Geo., Inc. 194
Scully-Jones & Co. ..... 4th Cover
Sellers & Co., Inc., William 153
Seneca Falls Machine Co. 34
Severance Tool Industries, Inc., Co. 53
Sheffield Corp., The 105
Sheldon Machine Co., Inc. 205
Sidney Machine Tool Co., The 183
Siewek Tool Co. 58
Skilsaw, Inc. 198
Smit & Sons, J. K. 130
South Bend Lathe Works 41
Standard Gage Co., Inc. 1
Standard Oil Co. (Indiana) 7
Stanley Works, The 189
Starrett Co., The L. S. 100
Stokerunit Corp. 25
Strong, Carlisle & Hammond Co., The 148
Stuart Oil Co., Ltd., D. A. 201
Sturdimatic Tool Co. 217
Sturdy-Bilt Equipment Corp. 222
Sturtevant Co., P. A. 170
Sundstrand Machine Tool Co. 34
Sunnen Products Co. 141
Super Tool Co. 44
Sutton Tool Co. 198
Swartz Tool Prod. Co., Inc. 144
Tamms Silica Co. 140
Tannewitz Works, The 172
Thompson & Son, The Henry G. 154
Threadwell Tap & Die Co. 184
Timesaver Products Co. 222
Timken Roller Bearing Co., The 48
Tomkins-Johnson Co., The 187
Torit Mfg. Co. 224
Trico Products Corp. 199
Tungsten Alloy Mfg. Co. 202
Tungsten Electric Corp. 149
Tuthill Pump Co. 213
Union Carbide & Carbon Corp. 47
United Chromium, Inc. 184
United Precision Prod. Co. 214
United States Drill Head Co. 223
Universal Engineering Co. 184, 194
Universal Wheel & Abrasive Corp. 59
Vanadium-Alloys Steel Co. ..... Front Cover
Van Norman Machine Tool Co. 57
Vascoloy-Ramet Corp. 4
Vinco Corp. 12
Vonnegut Moulder Corp. 216
Wales-Strippit Corp. 197
Warner & Swasey Co. 99
Welding Equipment & Supply Co. 116
Wells Mfg. Corp. 109
Wendt Sonis Co. 124
Westinghouse Electric & Mfg. Co. 61
Wheel Trueing Tool Co. 112
Willey's Carbide Tool Co. 219
Wilson Mechanical Instrument Co. 205
Wood & Spencer Co. 166
Ziegler Tool Co., W. M. 213

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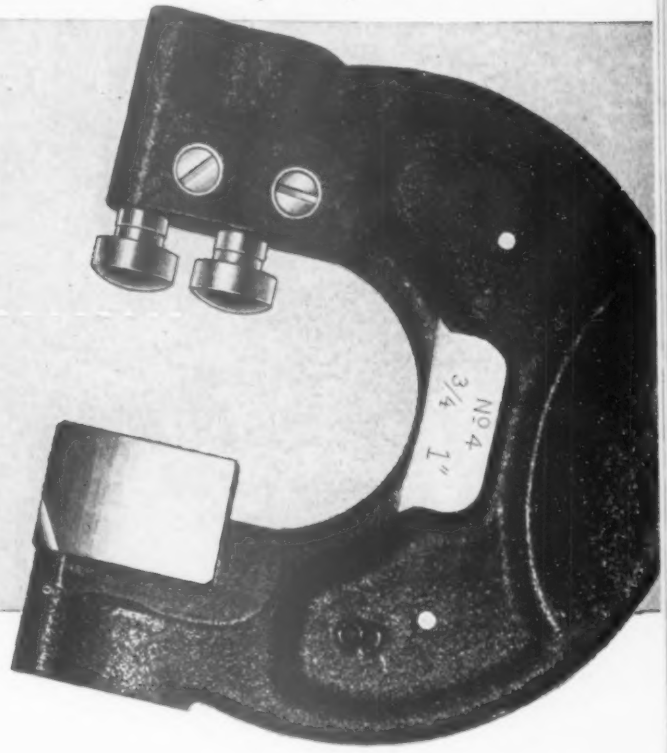

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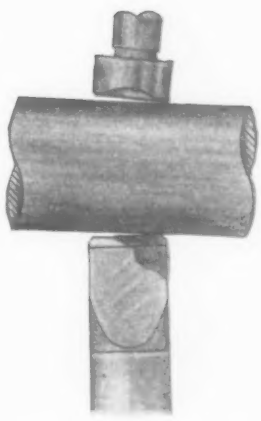
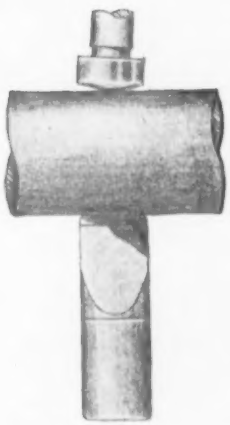


Conventional Snap Gage with flat surfaced gaging pins. The tilt is exaggerated to make the diagram clear. Note that only at their edges do the gaging surfaces contact the piece being gaged.



This illustration shows the Super Snap Gage with the pin shank at the same angle as in the diagram at the left. Note that the contact conditions are exactly the same as if the pin were not tilted.

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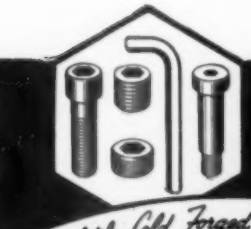

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The TOOL ENGINEER

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TECHNICAL FEATURES

Precision Forging Pinion Gears.....67
Aircraft Engine Gears, Production and Inspection 72
Studebaker Production of Aircraft Engine Gears 76
Induction Heating . . . in Shaping Bomb Casings 80
Compressed Air Strips Paper 81
Plant Layout 82
Nitriding High Speed Tools 87
Hard Chrome Plating by the Lundbye Process 88
Chrome Plating Gages 89
Grinding and Brazing Carbide Tools...91
Production Tool for Piercing Tubing ..93
Resistance Welding below the Frost Line 94
Production Data Sheet.....97
The Crib 98

MEN, MATERIALS and MACHINES

Production Perspectives 65
Conveyors Speed Aircraft Wing Manufacture 101
A Workable Safety Program 106
A.S.T.E. June California Meeting 111
Capital Communique 115
Industrial News Digest 121
Greenie — Cartoon Feature 121
Production Pix 133
New Equipment 162
New Literature 184
Handy Andy Says 194
Army-Navy "E" Award Winners.....196
ASTE Doings 200
Passing Parade 214
ASTE Meetings 224
Classified Advertising 224
ADVERTISERS' INDEX 226

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THE TOOL ENGINEER, in answer to many queries as to when the story on Timken-Detroit's achievement would appear, is glad to announce its publication, beginning on page 67 of this issue.

•

What's being done to achieve the ultimate in production from conventional gearing equipment is described in two other stories on aircraft gears. Both articles concern gears in the Wright Cyclone engine—one as produced at Paterson, N. J., and the other by the Studebaker Corporation.

Our thought is that through these three articles, gearing engineers will be able to compare their methods with those in ultra modern plants.

•

The need for exchange of ideas on this subject, and at this time, may be judged by the concern of the War Production Board over the possibility of a bottleneck, indicated by ever increasing demands for gearing equipment.

Lieutenant General William Knudsen, and K. T. Keller of Chrysler, have good reason to appreciate forged gears.

WPB isn't fooling when it points out that training of highly skilled machinists for gear cutting is one of the most serious problems before the industry. One man we talked to mentioned visiting a new plant where he found operators running a battery of hobbing machines backwards.

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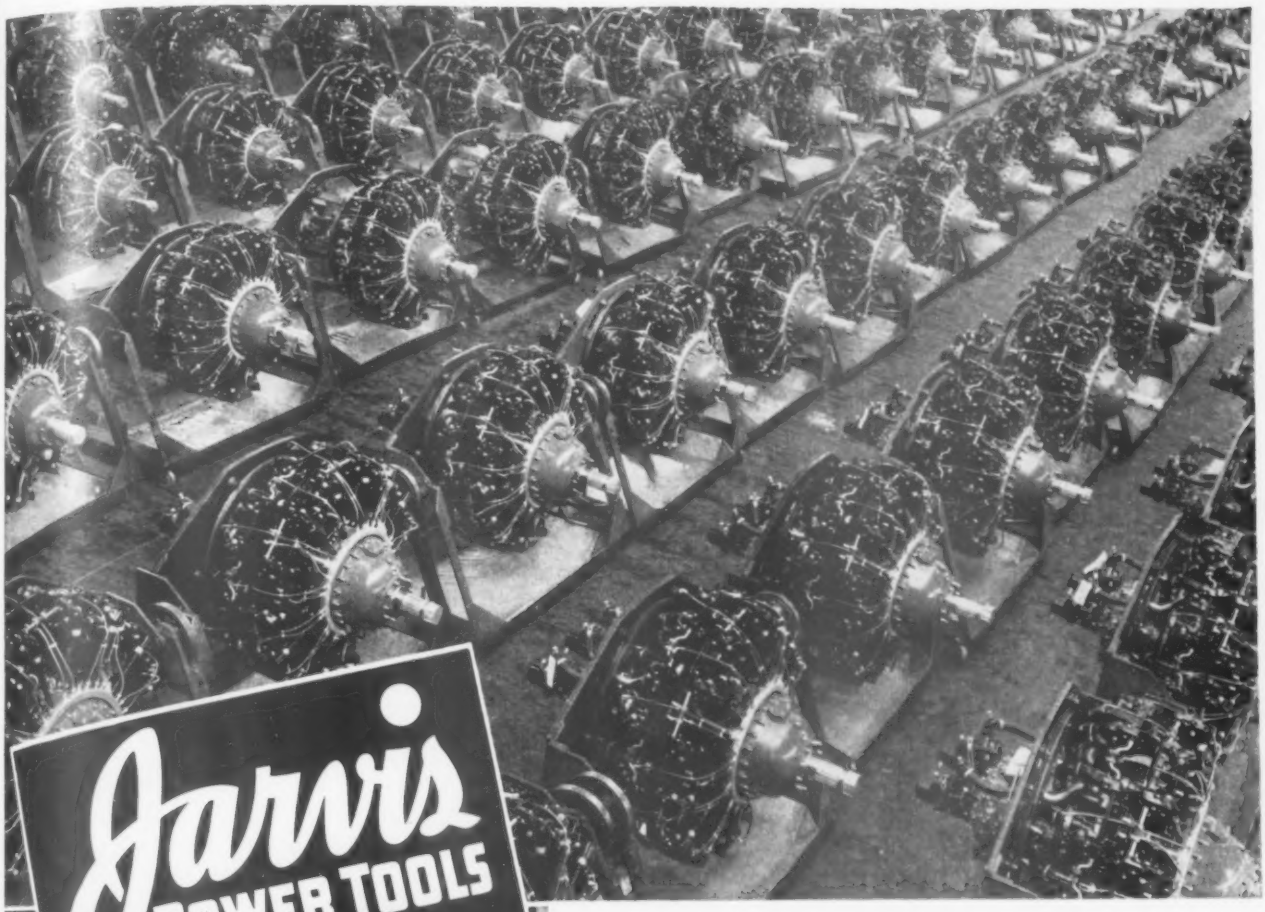

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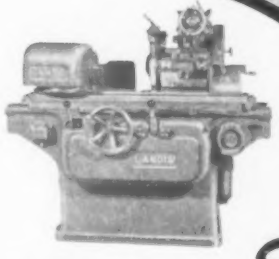

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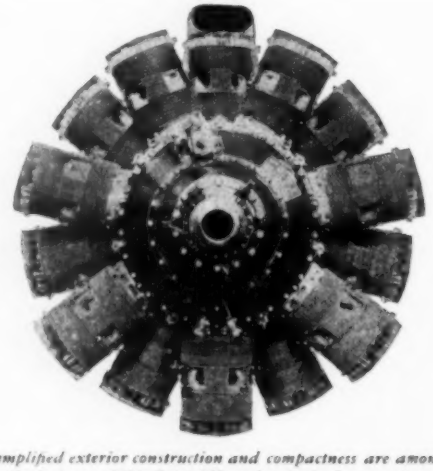
SOLVED A WARTIME PROBLEM

BOMBS
AND BRISTOL SLEEVES
OVER BERLIN



Simplified exterior construction and compactness are among the features of this Bristol Hercules single sleeve engine

Not only bombs were carried by those avenging Short-Sterlings giant bombers which left Berlin a hell of seething flame that gentle spring night in '43 . . . they carried, too, the sweat and skill of many men which made such flights possible. Take, for instance, the case of the Bristol Sleeve, and how a wartime problem was solved.

This sleeve is the heart of the Bristol Sleeve-Valve Engine—the engine whose outstanding performance has contributed so largely to the success of long range bombing raids by the R.A.F. Apparently only a simple cylinder of steel, actually its length and diameter and wafer thin wall make it so elastic, so unstable, that grinding it with the machine tools available during the development period could only be done in limited quantities and under laboratory conditions. But Bristol wanted laboratory precision plus mass production. How?

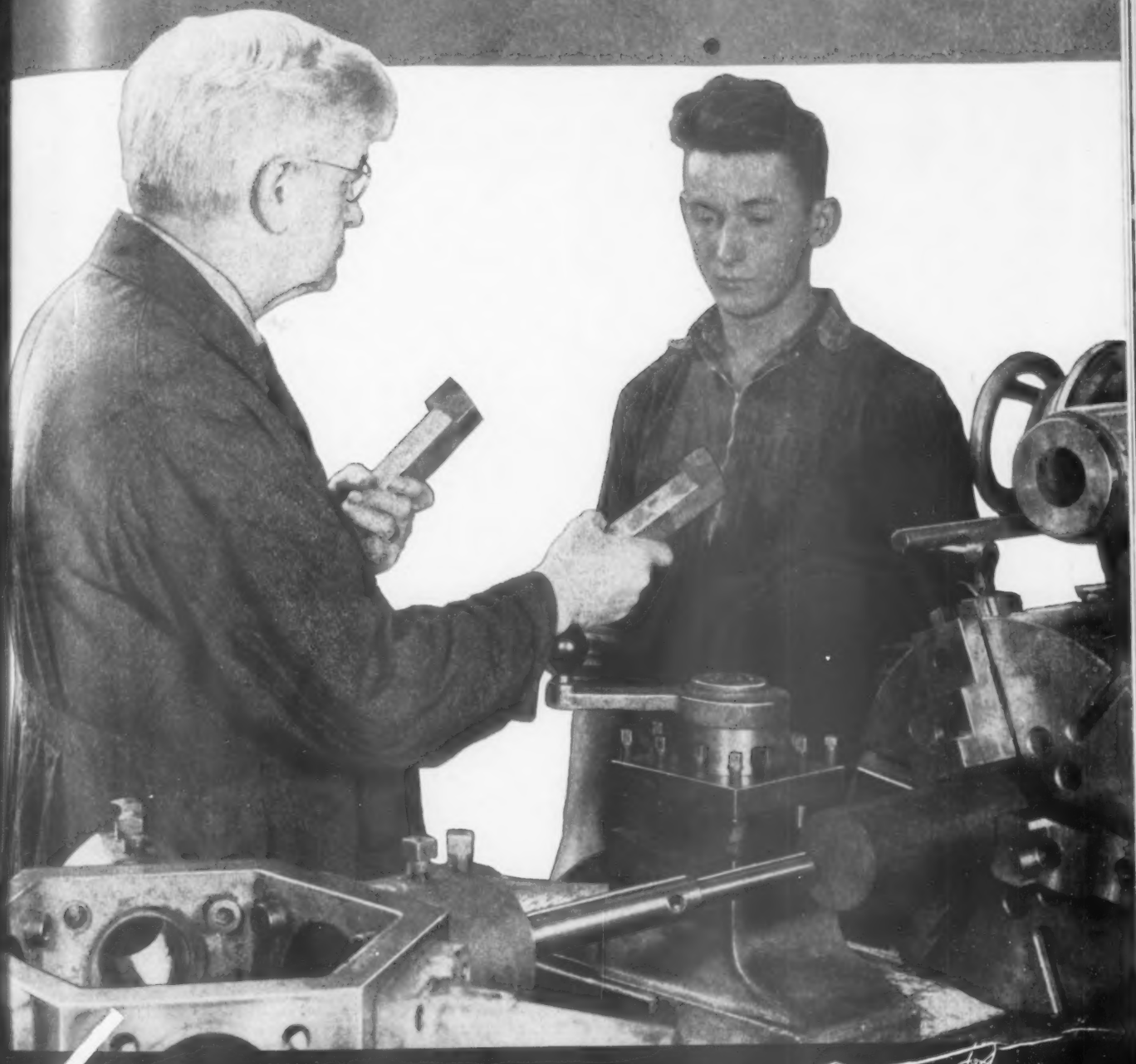
Calling in Heald Service Engineers produced the solution—a special Heald Internal Grinding Machine designed to grind the sleeve by the Centerless principle of supporting it and rotating it on the O. D. between three rolls—a solution so satisfactory that it has become a major factor in the mass production of Bristol Engines.

Have you a wartime problem or do you need assistance in post-war planning? If it involves precision finishing, HEALD ENGINEERING is available, now, to help you.

The HEALD Machine Co., Worcester, Mass.

For More Precision Faster, bring your problems to Heald

GOOD OPERATORS
never use dull tools!

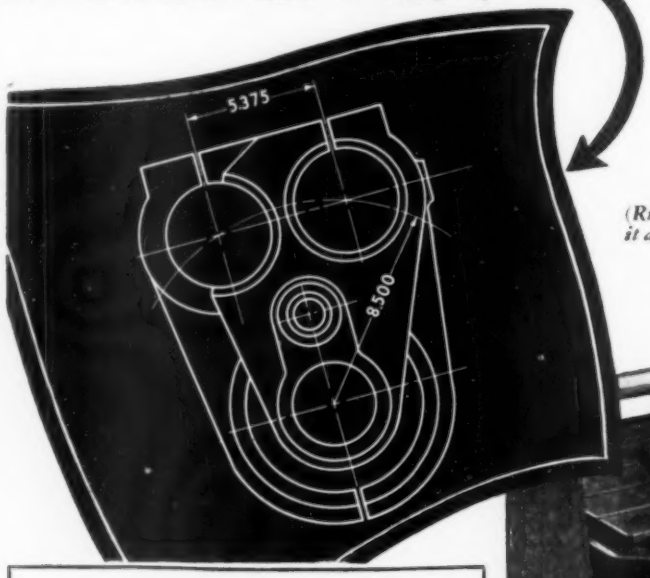


KEEP ALL CUTTING TOOLS SHARP!

Dull tools result in poor finish and rejected work.
They waste power and vitally needed tool steel.

★ *Reprints of this page are available for bulletin board use in your turret lathe department. Write the Gisholt Machine Company, 1229 East Washington Avenue, Madison, Wisconsin. Ask for "War-Time Care and Operations poster No. 3." State quantity required.*

Can You Hold Bore Locations as Close as This ?

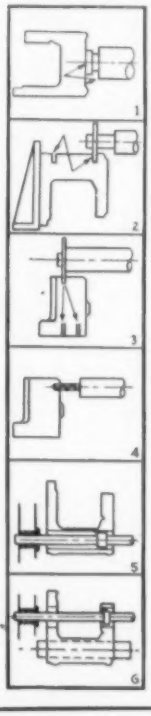


(Right) Operation 6 as it appears on machine.

Versatility:

FOR PROPER MACHINING SEQUENCE

Proper machining sequence is available through ample feeds and speeds and versatility of G & L Machines. The operations sequence on the arbor support, as performed on the G & L, is shown below.



1st Setting

OPERATION 1—Mill for locating purposes.

2nd Setting

OPERATION 2—Place on angle plate. Saw two 1/8" slots—with table feed.

3rd Setting

Same as 1st Setting, but turned 90°.

OPERATION 3— Saw three 1/8" slots—saw with head feed.

OPERATION 4—Drill *and Tap* three stud holes 25/32 drill—3/4–10 tap.

4th Setting

Place on Top Milled Surface.

OPERATION 5—Bore 2 holes.

5th Setting

Place part on dummy overarms.

OPERATION 6—Bore 2 holes. See machine illustration above.

Operations Performed on G&L include:

BORING, DRILLING, MILLING, SAWING *and Tapping*

This prominent manufacturer of machine tools uses his G & L Horizontal Boring, Drilling and Milling Machine for short run boring operations requiring extreme accuracy. On this arbor support the locations of the bores are held to exact drawing dimensions. It is a special support designed to fit a machine already in service. Each of the bores is cut with a saw for clamping purposes, and the part had to be bored so that when attached to the machine in the customer's plant the accuracy would be maintained.

G & L machines are being used for an endless variety of machining operations on both small and large parts in many industries. With G & L attachments and accessories there is practically no combination of operations that cannot be performed with great speed and economy. Feeds and speed ranges cover all metals, and practically any cutting requirements.

G & L engineers will be glad to make recommendations for faster machining of your work on G & L equipment. They are at your service.

GIDDINGS & LEWIS MACHINE TOOL COMPANY

132 DOTY ST., FOND DU LAC, WISCONSIN

FREE DATA *Information covering the complete line of G & L machines and time-saving attachments and accessories is included in this catalog. Write for your copy. Ask for Catalog No. 55.*

Out of the war comes

CROMOCO

AIR-HARDENING DIE STEEL

A "Substitute" that outperforms Cromovan!

SEND FOR BULLETIN SL-2002

One of the permanent benefits that will result from the war-time shortage of **vanadium** is the increasing knowledge and use of metals such as **cobalt.**

When, as a war measure, we were obliged to omit vanadium from Cromovan High-Production Die Steel, we substituted cobalt—with surprisingly good results. We named this new die steel CROMOCO.

The new grade **retains** the characteristics that made the older grade such a favorite: **Air Hardening; Ease of Machining; Non-Shrinking; Intense Hardness; High Compressive Strength;** and **Great Resistance to Abrasion.** And, we now find that CROMOCO actually outperforms its peace-time predecessor!

ARMY E NAVY

Firth-Sterling

STEEL COMPANY

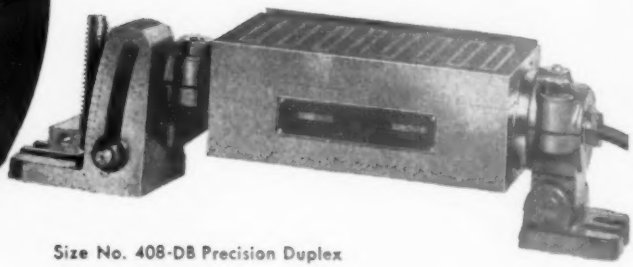
Also makers of "FIRTHALOY" Carbide Dies for Deep Drawing

OFFICES: McKEESPORT, PA.-NEW YORK-HARTFORD-PHILADELPHIA-CLEVELAND-DAYTON-DETROIT-CHICAGO-LOS ANGELES

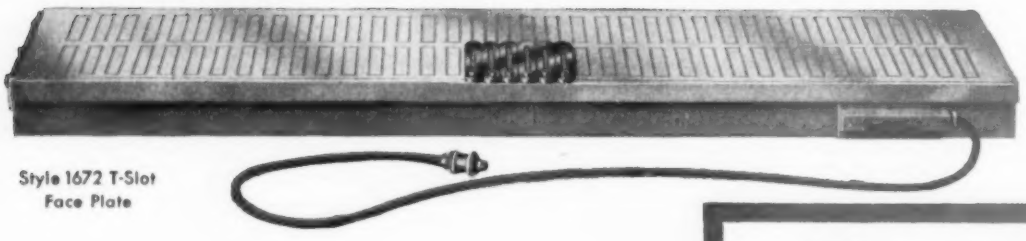
All Types and Sizes of the Fastest Set-up Devices...

TAFT-PEIRCE *Superpower* MAGNETIC CHUCKS

Style 1236 Fine Mesh Face Plate



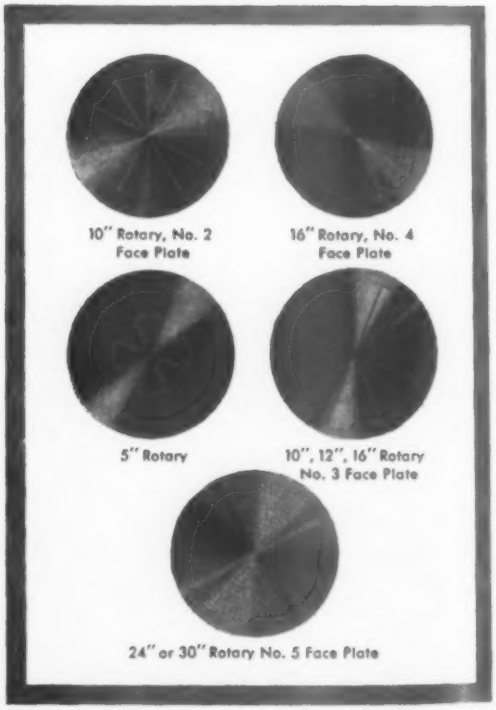
Size No. 408-DB Precision Duplex



Style 1672 T-Slot Face Plate

You can get exactly the *Superpower* you need to speed high-rating war production by saving set-up time . . . not only on grinders . . . but also on millers, planers, shapers, lathes. *Superpowers* are useful, too, in non-machine applications wherever there is a problem of holding ferrous materials. The full line includes rectangular, tilting base, and rotary models . . . each with greater holding power and magnetic area than other chucks of equal dimensions.

SEND FOR NEW ILLUSTRATED BULLETIN giving full mechanical facts, showing typical applications, and including Taft-Peirce approved switch equipment, demagnetizers, and magnetic V-blocks and parallels.



10" Rotary, No. 2 Face Plate

16" Rotary, No. 4 Face Plate

5" Rotary

10", 12", 16" Rotary No. 3 Face Plate

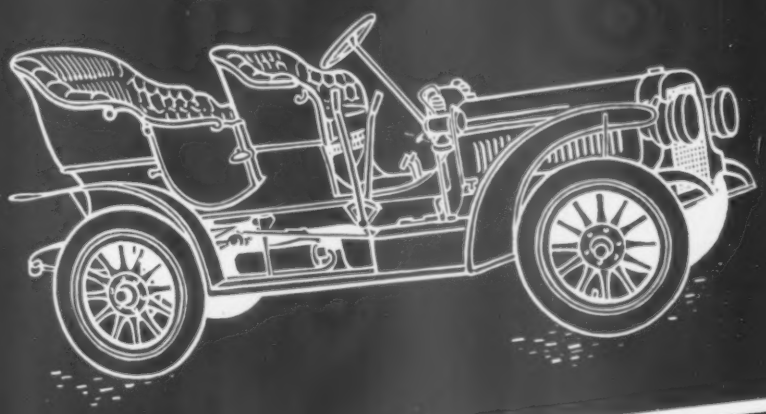
24" or 30" Rotary No. 5 Face Plate

Superpower IS A PRODUCT OF

THE TAFT-PEIRCE MFG. CO.

WOONSOCKET, RHODE ISLAND

THE SECRET WEAPON THAT WILL WIN THIS WAR!



THERE it is . . . an incredible fact. In a Model 1906 Cadillac Automobile is the secret weapon that will win this war! Here's the story:

In 1906, Henry Martyn Leland shipped three Cadillac cars to England. In the presence of officials of the Royal Automobile Society, mechanics completely disassembled those three cars, heaped the parts together in a giant potpourri, mixed them thoroughly . . . and then, out of the heap, they assembled three Cadillac cars complete, to the very austere amazement of the Royal Automobile Society.

Whereupon, those three classic jalopies of an early American vintage were put through a gruelling 500-mile test, and they came through triumphantly.

Thus, 36 years ago, an American-made car — built by the Interchangeable, or *American* System of manufacturing — was the first automobile in the world to win the respect of Europeans who believed that fine cars could only be built by hand!

In this little fact, hidden in the ancient chassis and motor of a 1906 Cadillac car, is the secret of the weapon that will win this war. For without the greatest machine tool industry in the world, the automobile industry as we know it — and the American System of manufacturing — could never have developed to our present world-leading and *World War-winning* standards.

* * *

Starting with the interchangeable manufacture of gun parts, shown at the Crystal Palace, London, in 1851, long before the birth of the automobile, Robbins and Lawrence and its direct successor, Jones & Lamson, have developed and improved the precision machine tools that have helped to make that industry's growth possible.

As a result, instruments and machines designed by this company are today in the front line of the greatest single war-producing industry on earth. And it is because of this record of achievement that Jones & Lamson engineers are considered so well qualified for consultation on your present and your post-war problems.

JONES & LAMSON
MACHINE COMPANY
Springfield, Vermont, U. S. A.

Manufacturers of Ram & Saddle Type Universal Turret Lathes . . . Fay Automatic Lathes . . . Automatic Thread Grinding Machines . . . Comparators . . . Automatic Opening Threading Dies and Chasers

Profit Producing Machine Tools

"LOGAN"

GEROTOR HYDRAULIC PUMPS

3/4 to 30 G.P.M. CAPACITIES 1000 P.S.I.

"LOGAN" offers a line of 1000 P. S. I. Gerotor Oil Hydraulic Pumps for industrial applications. Simple, efficient and compact these pumps are designed and built to operate continuously in capacities ranging from 3/4 to 30 G.P.M. "LOGAN" Gerotor Pumps possess many advantages: Long Life, only three moving parts—Interchangeability, all parts interchangeable—Mechnical Efficiency, very high due to patented Gerotor principle—Speed, pump revolves at motor speed through direct coupling. The "LOGAN" Gerotor Line is complete with most models and sizes available from stock. Write or wire today for Bulletin 480 and complete information.

WRITE FOR *New* "LOGAN" GEROTOR BULLETIN 480

LOGANSPORT MACHINE, INCORPORATED

902 PAYSON ROAD LOGANSPORT, INDIANA

★MANUFACTURERS OF AIR AND HYDRAULIC DEVICES, CHUCKS, CYLINDERS, VALVES, PRESSES AND ACCESSORIES★

We're not interested in ZOOT SUITS

but we are interested in the phenomena of change...

We're not rug cutters, and we're distinctly not "right with the rags." We don't wear a "solid suit of threads," padded at the shoulders like a lunatic's cell, with the "jut cuts" and the "reat pleats," the "cleave sleeves" and the "drape shape." That sartorial throwback of a juvenile ego is definitely not down our alley.

We're specialists in internal grinding problems, and Zoot suits (we fervently pray) won't wield their foolish influence upon the wheels of industry . . . but many a simple fad has!

When a boy and a girl once sat in a hammock, and he thrummed a mandolin and she softly sighed, "I just love your new soft collar" — the celluloid collar market quietly vanished from this earth . . . And the horse-and-buggy business employed a million men — until an explosive contraption, deplored as a dangerous fad, noisily disemployed them and put ten times their number to work.

No, we're not interested in Zoot suits, but we are interested in the phenomena of change. And this is the fastest-changing period in all of industrial history. As a result, many businesses, seemingly on the rise, are actually on the brink of failure in the post-war world of better and cheaper materials.

We've developed many new techniques in grinding these materials, and we believe that this knowledge can be of greater value to manufacturers today than ever before. Bryant's Consulting Service is available to you at all times, and we urge you to call upon us now!

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

PHOTO BY U. S. ARMY SIGNAL CORPS

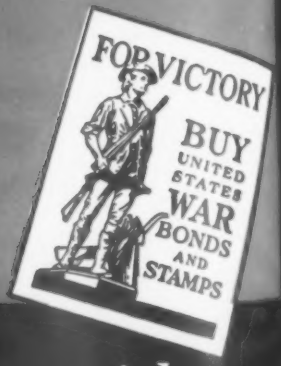
P&J AUTOMATIC CHUCKING EQUIPMENT

In quantity, quality and variety of parts produced, P&J machines are playing a vitally important part in war production. This fast, powerful equipment is meeting every demand made upon it for maintained accuracy, capacity and ease of handling. Production records, hitherto considered outstanding, are being broken again and again as the versatility of P&J tooling opens up ways and means to improve performance and reduce operation time.

Potter & Johnston's many years of experience in the production of duplicate parts is being applied to great advantage today in stepping up the production of vitally needed war equipment.

IS TOOLED FOR THE MAXIMUM PRODUCTIVITY OF PARTS . . .

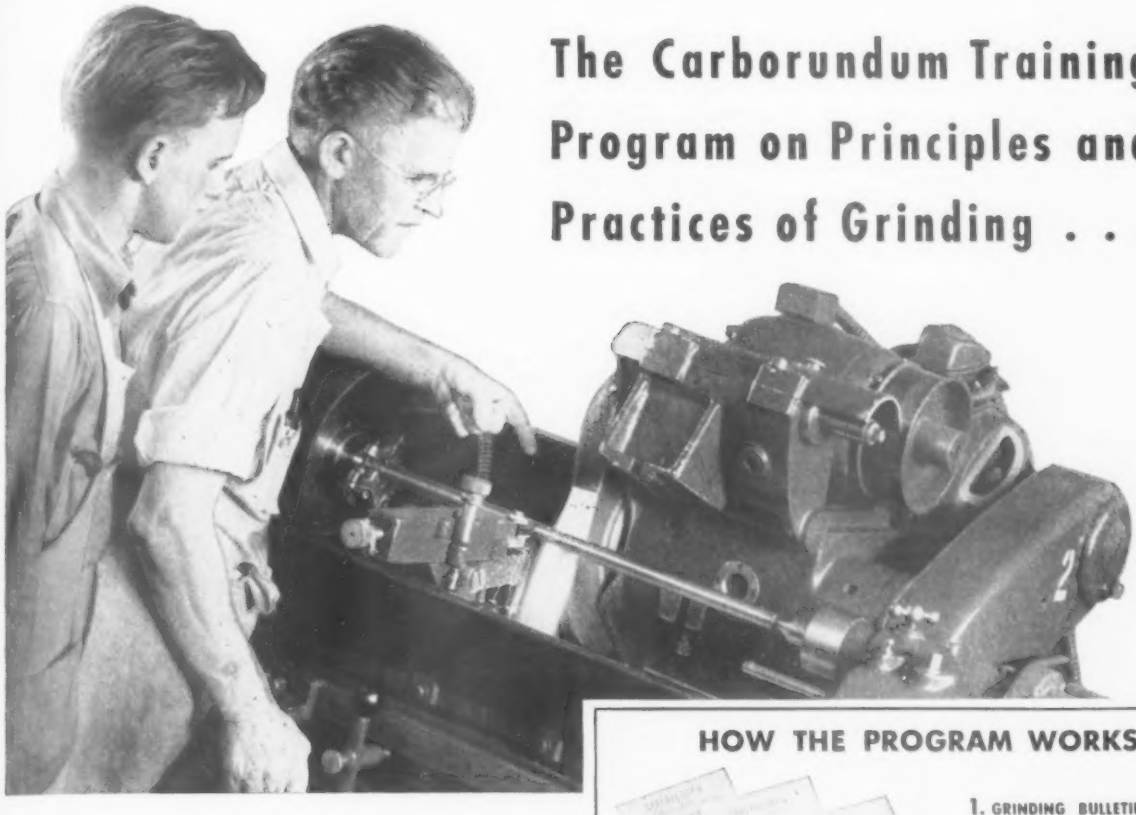
For anti-aircraft guns, tanks . . . and other weapons of war.



The POTTER & JOHNSTON MACHINE COMPANY
Pawtucket, R. I.

Bottle the enemy quicker...
WITH MORE WAR BONDS

FREE! FOR TRAINEES IN INDUSTRY!



The Carborundum Training Program on Principles and Practices of Grinding . . .

THE problem of training green workers for precision war work is one of the biggest jobs industry has ever tackled.

Here is our contribution to its solution—a streamlined course in the principles and practices of grinding, offered to trainees in *your* Plant!

The purpose of the Carborundum Training Program is to explain in simple, non-technical terms the fundamentals of grinding and thereby help make better grinder hands of trainees, apprentices and students.

This course is designed for both classroom and small group instruction. Since its introduction, it has been widely adopted throughout industry. We hope it may help you, as it is helping others, to simplify the training of new grinder hands and to speed them on their way to higher production and greater accuracy.

THE CARBORUNDUM COMPANY
REG. U. S. PAT. OFF.

Niagara Falls, N.Y.

MANUFACTURERS OF GRINDING WHEELS, COATED ABRASIVES, SUPER REFRACTORIES, HEATING ELEMENTS

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids

(Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company)

HOW THE PROGRAM WORKS:

1. GRINDING BULLETINS. A set of 25 four-page bulletins for each trainee, offering a concise, non-technical discussion of grinding wheels and their functions. Sample of the contents: "The Abrasive Tools of Industry", "Wheel Stresses", "Wheel Balancing", "Cylindrical Grinding", "Grinding Errors", "Safety".

2. BOUND VOLUMES. A limited number of bound Grinding Bulletins are available for instruction as well as for placement in your classroom or technical library for reference purposes.

Educational Service Department
THE CARBORUNDUM COMPANY, NIAGARA FALLS, N.Y.

We would appreciate your sending us added information on the Carborundum Training Program.

☐ We have regular apprentice training courses. Average enrollment _____ students.
(Number)

☐ With _____ instructors assigned.
(Number)

☐ With adequate classroom facilities

Name.....

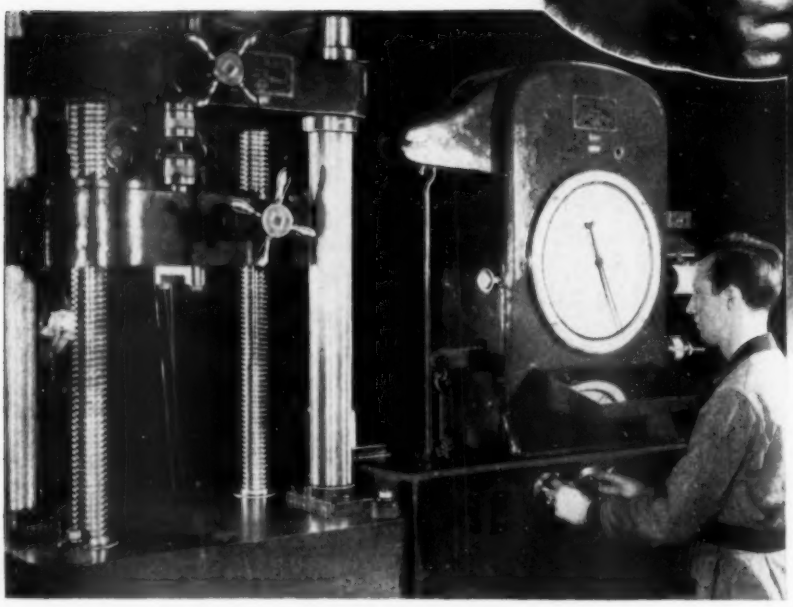
Title.....

Company.....

City and State.....

GARGANTUA

is a sissy...



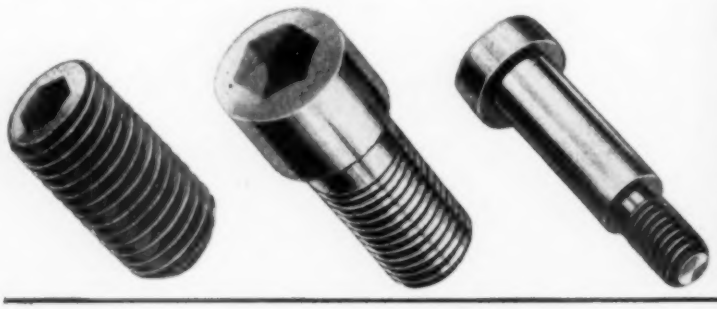
. . . compared to the mechanical brute that proves the surplus tensile strength of Parker-Kalon Socket Screws

This 100,000 pound capacity Olsen Universal Tester in the P-K Laboratory checks every batch of Parker-Kalon Cold-forged Socket Screws to make sure that they meet the high Parker-Kalon standards for Tensile Strength.

The tensile test is only one of 16 check-ups that are made to assure the unfailing performance of P-K Cold-forged Socket Screws. This rigid routine of *quality control* eliminates the "doubtful screws" – screws that *look* all right, but may fail to *work* right. Socket Screw users need this protection today more than ever. Specify Parker-Kalon next time you order . . . it costs no more. Parker-Kalon Corp. 190-198 Varick Street, New York, N. Y.

This 16-point "Quality-Control" protects P-K Socket Screw Users

1–Chemical Analysis. 2–Tensile Strength. 3–Ductility. 4–Torsional Strength. 5–Ability to take Shock Loads under Tension. 6–Resistance to Shock Loads under Shear. 7–Hardness. In addition, there is a rigid inspection of these essentials: 8–Head Diameter. 9–Head Height. 10–Concentricity of Head to Body. 11–Socket Shape. 12–Socket Size. 13–Socket Depth. 14–Centricality of Socket. 15–Class 3 Fit Threads. 16–Clean Starting Threads.



PARKER-KALON

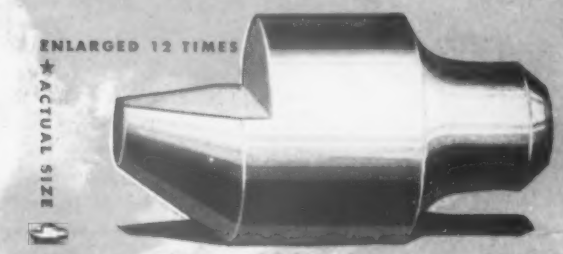
Quality-Controlled

SOCKET SCREWS

Firepower!

The amazing accuracy and effective firepower of the new Carbine has made it a weapon of opportunity for our fighting men. We, of Ceco, are proud to have played a small part in speeding its quantity production.

This Plunger used in the Carbine is produced by Ceco in *one complete operation* (including milling the flat) instead of the two formerly required with a resulting saving in time, rehandling and reoperation.

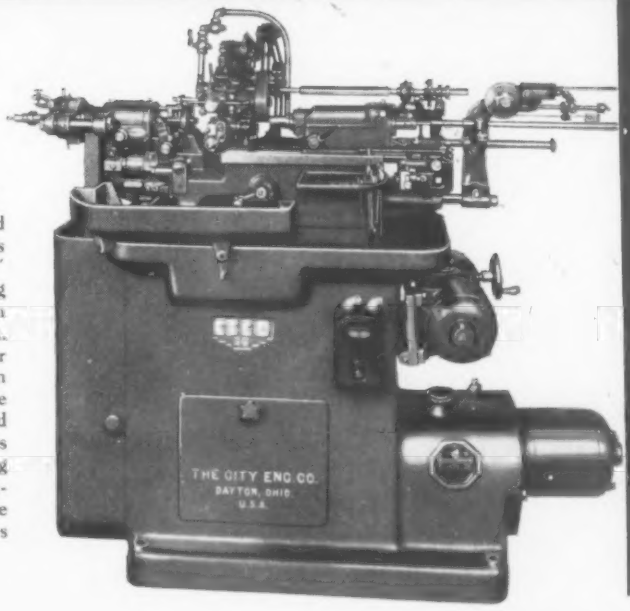


UNTIL VICTORY . . . Ceco Automatic Screw Machines will continue to help turn out, faster and more economically, hundreds of extremely accurate parts for America's mighty weapons of land, sea and air.

CECO IS AVAILABLE IN 3/8" AND 1/2" BAR CAPACITY WITH 4 OR 5 RADIAL TOOL SLIDES

The CECO 3-8 illustrated has four Radial Tool Slides with bar capacity of 3/8" diameter and a turning length of 1½" with flat cam and 2¼" with bell cam. Master Speed Ranger varies Spindle speed from 675 to 6,100 r.p.m. at the turn of a handwheel. And for simplicity, CECO's Precision Roller Bearing Spindle is always in adjustment and its Constant Rise Feeding Mechanism gives more accurate feeding.

WRITE FOR COMPLETE ILLUSTRATED DATA



CECO

SWISS TYPE *Automatic*

UNIVERSAL PRECISION SCREW MACHINES

★

Engineered and Manufactured by
THE CITY ENGINEERING COMPANY
Dayton, Ohio

★

Since 1909, Designers and Builders of Tools, Dies, Fixtures and Special Purpose Machinery.

FROM BAR STOCK TO FINISHED PIECE IN ONE OPERATION CAME THESE TYPICAL CECO-MADE PIECES

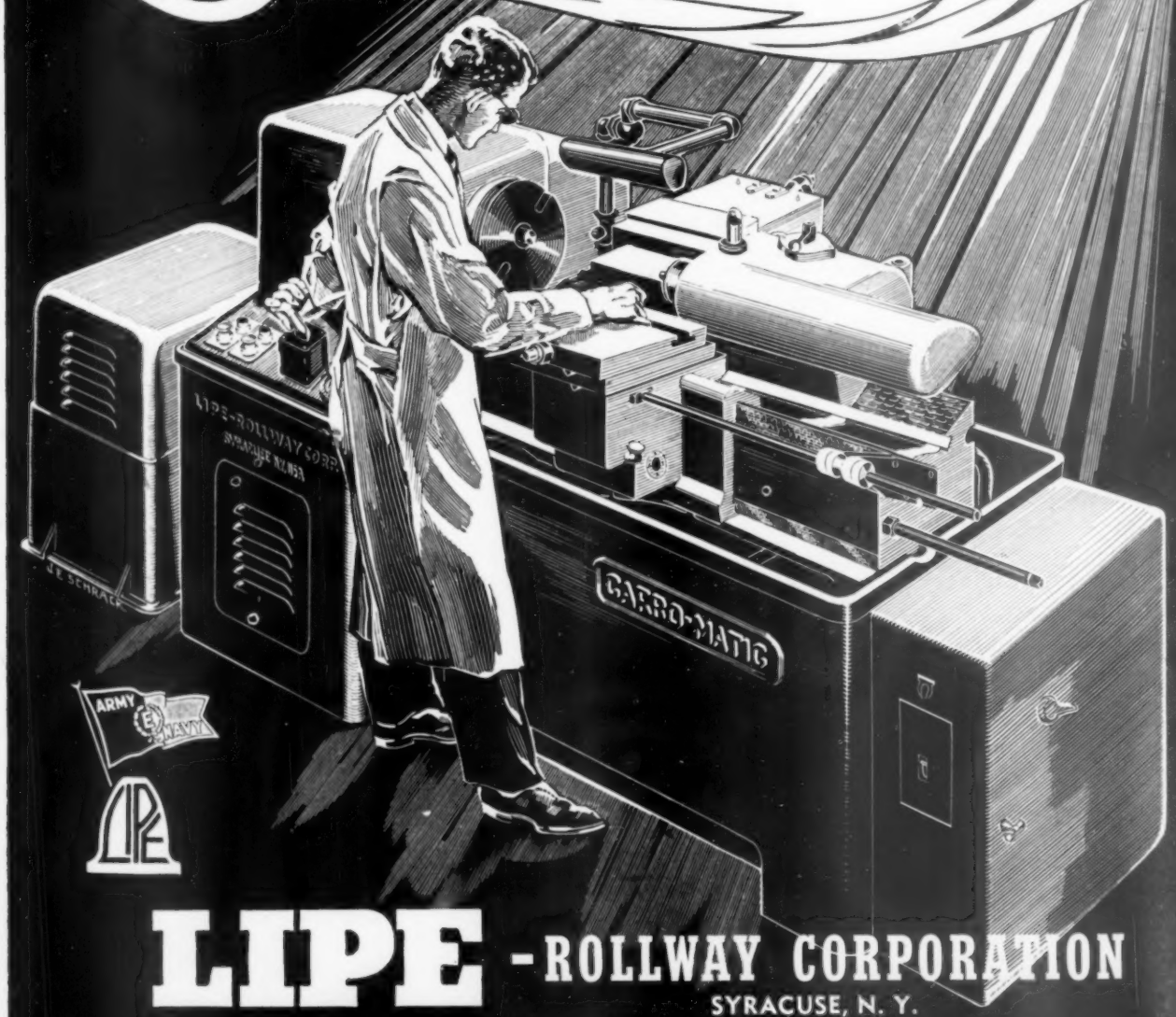
Rough-Turned, Heat-Treated 3" Shell Forgings
Finish Turned to .0005" in One Pass with an .090" Cut and a .010" Feed

LIPE *Carbo-Matic* LATHE

still holds its accuracy after 3 years of this use

Henry J. Kaiser's definition of a man's ability to produce as "ability to take punishment" is doubly true of today's high production machine tools. And that's just where the Lipe Carbo-Matic Lathe shines. It was designed and built for today's higher production schedules, tougher alloys, finer tolerances, and especially for the "hogging" cuts of cemented carbide tools. Massive ruggedness, coupled with the smooth-flowing drive of cone-worm gears, assures unusually high precision and finish at a faster pace, with less tool wear and tool breakage.

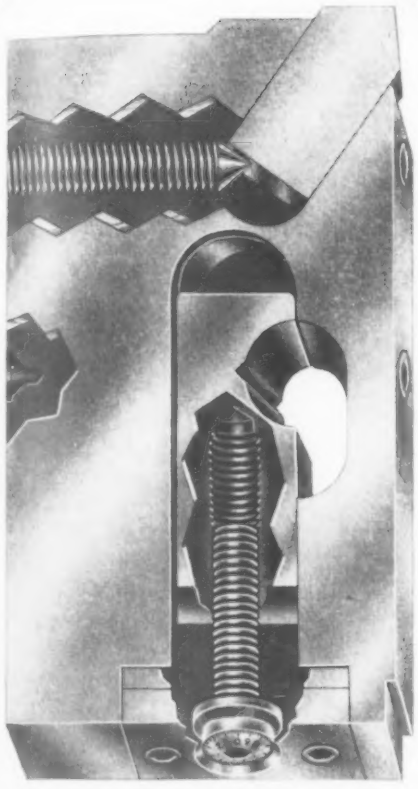
Fully automatic. Hydraulic holding equipment, feeds, tailstock quill. Swing over bed 15", over carriage 8", between centers 30"



LIPE-ROLLWAY CORPORATION

SYRACUSE, N. Y.

NEW— Nothing Like It— For Horizontal Boring Machines!



This newly designed block provides an efficient and economical setup for rough, semi-finish and finish boring operations. It is also suitable for use in Davis bars with standard-sized block slots.

DAVIS Single Cutter Micrometer Adjustable Block

This new DAVIS achievement is a complete innovation in boring, designed chiefly for line boring bar practice, where rigidity and a wide range of cutter adjustments are the main requisites.

The DAVIS Single Cutter Micrometer Adjustable Block provides:

1. Suitable size blocks and cutters with wide range of adjustment.
2. Exclusive and accurate means of adjusting and setting cutters to size.
3. Block and cutter adjust as a unit, insuring full cutter support at all settings.

Write Today for Descriptive Bulletin No. 600

DAVIS BORING TOOLS

DAVIS BORING TOOL DIVISION
LARKIN PACKER COMPANY, INC., ST. LOUIS, MO.

YOU PROFIT MOST: When the TAPS you buy combine the accuracy required to meet fussy specifications with the RUGGED tool strength built into them by WINTER craftsmen. This "KNOW HOW" is your guarantee of fast, uninterrupted production on your threading job.

REMEMBER! Conclusive laboratory tests show that the power required to ***break*** a tap is several times that which is necessary to ***cut*** a thread—IF THE TAP AND HOLE ARE IN ALIGNMENT!

A Division of

THE NATIONAL TWIST DRILL & TOOL CO.

ROCHESTER, MICHIGAN

Winter Brothers

COMPANY Wrentham, Massachusetts, U.S.A.

Honing

helped change the "Horseless Carriage" Into AUTOMOTIVE TRANSPORTATION

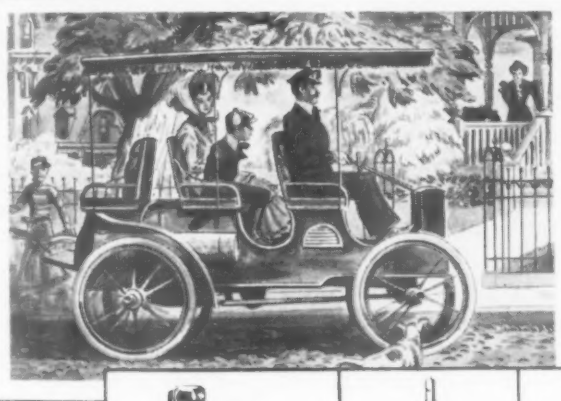
Yesterday—The horseless carriage and its immediate successors proved that a "newfangled contraption" could become an everyday useful device. Its early success could not have been possible without grinding—the first controlled abrading process.

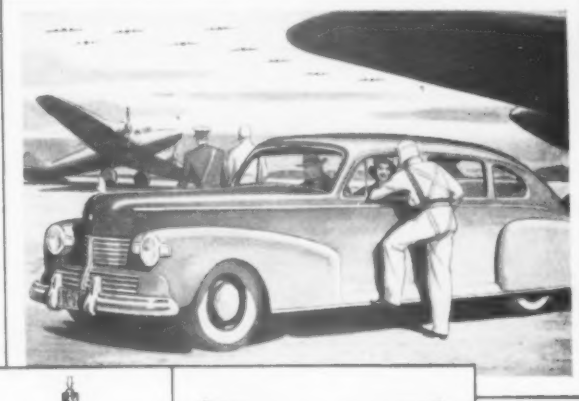
Today—The beautiful sturdy automobile is a marvel of mechanical development and efficiency. It can be well made in millions where its predecessor was poorly made in hundreds. HONING, which provides further control of abrading action, made it possible to make this refined mechanical job in huge quantity.

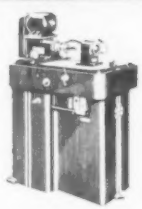
Tomorrow—**Nobody knows what mechanical devices may suit the public need, or catch the public fancy, tomorrow. Postwar planning is not yet definite. But as today's equipment came from yesterday's developments, so tomorrow's will derive from today's. Most of the things we will use tomorrow are already developed.**

One thing is certain—mechanical devices used tomorrow will demand better control of machining methods.

And Micromatic has been developing hone abrading controls to be ready for that demand.

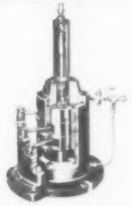






HONING MACHINES

HONING TOOLS



HONING FIXTURES

ABRASIVE STICKS

Micromatic HONE CORPORATION

Detroit, Michigan

MAKERS OF HONING MACHINE TOOLS

220 VOLTS ON THE NOSE

—Here's JAP JOLTAGE where it hurts!

Other "Jap Jolters" Covered in Booklet

How Often Should Tools Be Inspected?
What To Do When Tools Are Inspected.
Correct Amounts of Grease To Use.
Ball Bearings—Replacement and Care.
Switches—How To Prolong Their Life.
Care and Repair of Cable.
Causes of Stator Troubles and Overheating of Tools.
How To Order Spare Parts.
Selection of Frequency Changers.
"Shorts", "Grounds", Single-Phasing.
Fusing For Peak Output.
Safety Rules.

Ask for "Keep 'em Working" Manual

HIGH-CYCLE tools are designed for operation on 220 volts and best results are obtained if voltage does not exceed 240 or drop below 210.

High voltage causes tools to heat under light loads; low voltage makes them heat under heavy loads. And overheating is hard on the tools.

Hence to keep your High-Cycle tools whirling to Victory—watch your Voltage! Check it from time to time and keep it at maximum Jap-joltage—220 volts (at the tool).

Power Supply and Wiring on Page 8 of the booklet "Keep 'em Working", is just one of many full discussions of High-Cycle maintenance problems to keep your tools up to war-winning par.

These pointers are also presented in condensed form on a handy wall chart. A similar Plan is available for AIR tools. They're free to plants that'll put them to work.

AIR

THE ROTOR TOOL CO.

CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

HIGH CYCLE

MANY industries depend upon EX-CELL-O Precision Thread Grinders for production of accurately threaded hardened parts for war work. Outstanding is the aircraft industry. Aircraft engine manufacturers in the United States are using precision thread grinders for threading parts such as cylinder barrels, crankshafts, propeller shafts, crankshaft bearing bolts, connecting rod bolts, tappet adjusting screws, etc. . . . EX-CELL-O precision thread grinders are so dependable that what formerly would have been considered very delicate threading operations on aircraft engine parts are now handled easily, with assured accuracy, high finish, production. . . . EX-CELL-O precision thread grinders grind fine threads directly from heat-treated blanks and finish grind coarser threads after heat treatment.

EX-CELL-O CORPORATION • DETROIT

Below: Ex-Cell-O's new catalog on precision machine tools, cutting tools, and other Ex-Cell-O precision products. Contains illustrations, descriptions, and specifications. A copy will be mailed free to any request on business letterhead. Ask for Ex-Cell-O Catalog No. 27121.

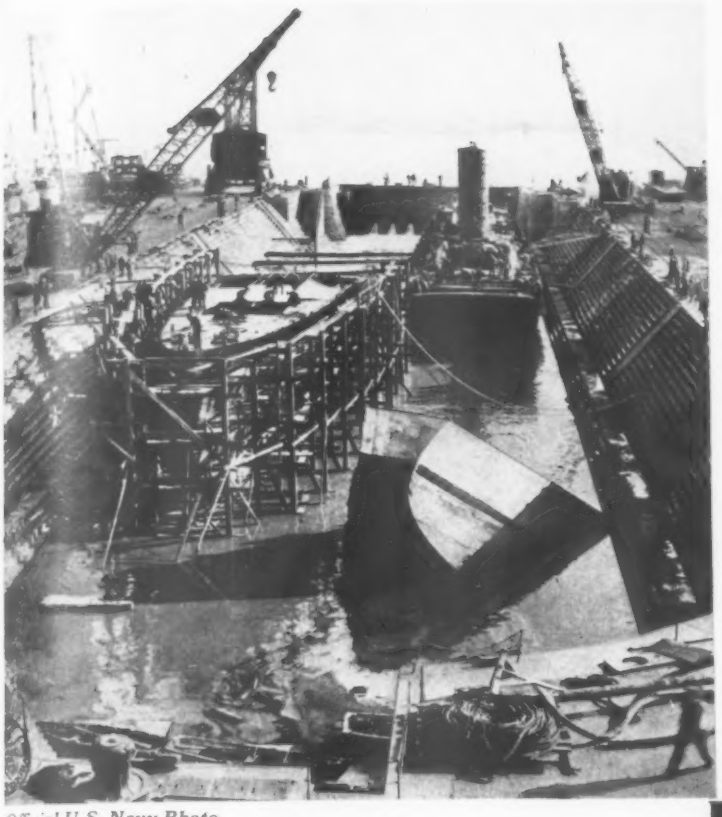
"We finish grind these fine pitch threads from hardened solid blanks . . . on EX-CELL-O Thread Grinders!"

XLO
EX-CELL-O for PRECISION

Extreme Accuracy In Form and Lead...*With High Production*

At Right: One of nine styles of Ex-Cell-O Precision Thread Grinders—Style 33 Automatic.

Precision THREAD GRINDING, BORING AND LAPPING MACHINES • TOOL GRINDERS • HYDRAULIC POWER UNITS • GRINDING SPINDLES • BROACHES • CONTINENTAL CUTTING TOOLS • DRILL JIG BUSHINGS • DIESEL FUEL INJECTION EQUIPMENT PURE-PAK CONTAINER MACHINES • R. R. PINS AND BUSHINGS • PRECISION PARTS



Official U.S. Navy Photo

WAR *hits 'em hard!*

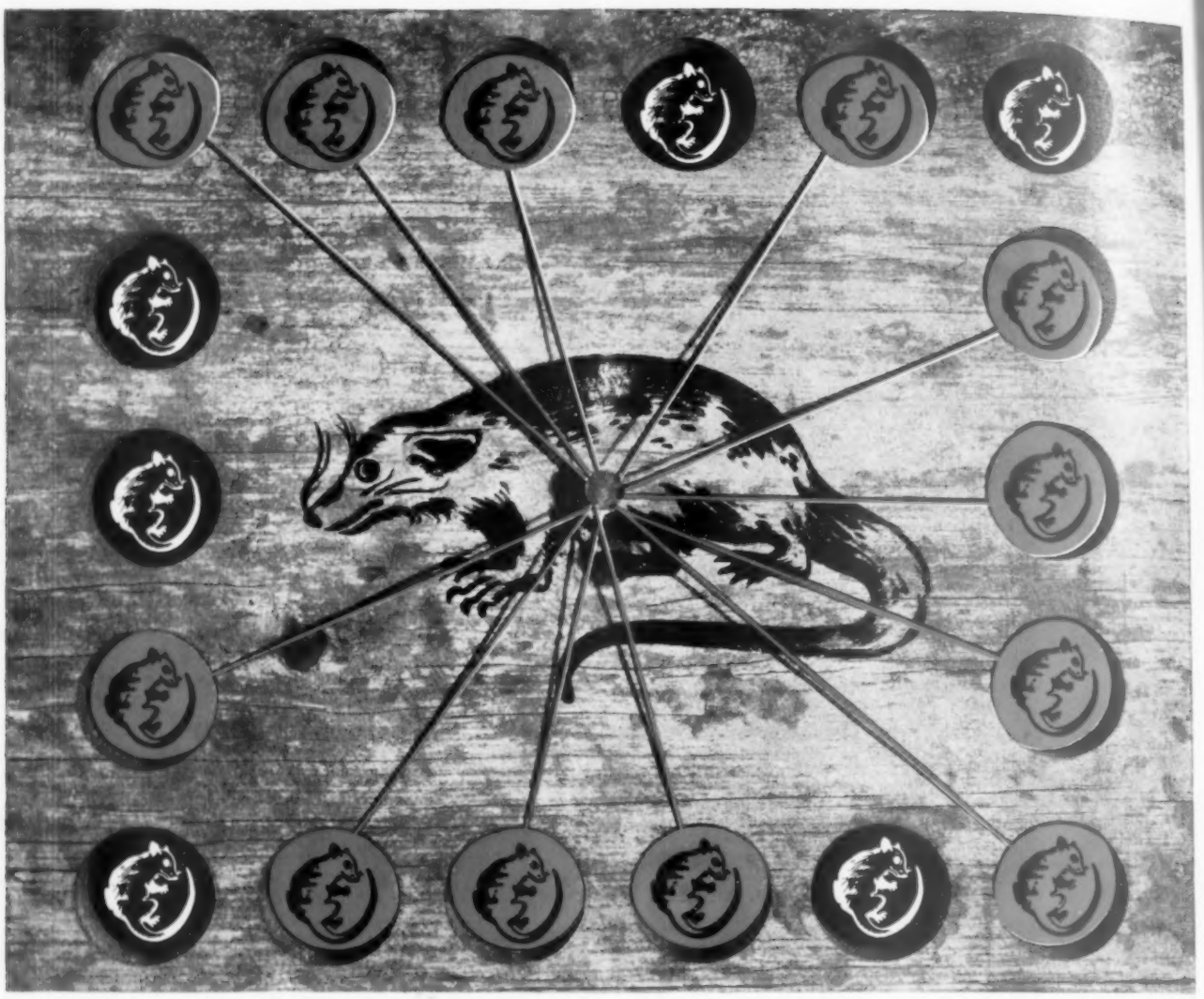
★

machine tools, like ships, need time out for repairs

At Pearl Harbor the U.S.S. Shaw suffered a destructive hit on her forward section. Bombs blew off the entire bow of the destroyer. But the determined Navy fitted the battle-scarred ship with a temporary false bow and sailed her across the Pacific to a West Coast Navy Yard, where, as the photograph shows, she was joined to a new bow. "Good as new," the Shaw has long since returned to battle. ★ Battles today start on production lines. Machine tools are weapons of production. This war hits 'em hard! They take more punishment in a single year of intensive, day-and-night shifts than in a decade of normal production. They, too, must be speedily and efficiently rebuilt when they break down. ★ Simmons has restored many hundreds of worn-out, damaged machine tools to perfect working condition. This company has the experience and facilities to solve your rebuilding problem quickly. Ask for full details on "The Simmons Way." Simmons Machine Tool Corporation, 1810 N. Broadway, Albany, N. Y.

ARMY E NAVY

SIMMONS *Engineered* MACHINE TOOL REBUILDING



Nature's most tragic mistake

THE POSSUM'S LITTER consists of 18 babies. But mother possum can only accommodate 12. At birth, there's a mad scramble for the 12 nipples, and the first arrivals don't budge **for 6 weeks!** The other 6 babies just look on... and die of starvation.

What an ironic circumstance! A mother forced by fate to watch her own babies starve! And what a pointed illustration of the ruthlessness of Nature. In Nature and in business, the fight for survival is equally vital. Failure to keep abreast of changing conditions has invariably doomed the less alert industrials to business death.

Because they affect almost everything we touch, machine tools will be more necessary than ever in the post-war era. Machine tools are essential today to the output of the food you eat, the clothes you wear, your automobile, your vacuum cleaner, your washing machine, your refrigerator. Machine tools not only create new industries, but they create employment. They are largely responsible for our present way of life... unequalled by any other country in the world.

In our post-war era, Cone Automatic Multiple Spindle Lathes will be even more essential than they are now. Their unique advantages will help bring us all higher standards of living than we have ever known before.

CONE Automatic Machine Company, Inc., Windsor, Vermont

Deep Drawn Bomber Parts are Turned out Quickly at the FORD Willow Run Plant on

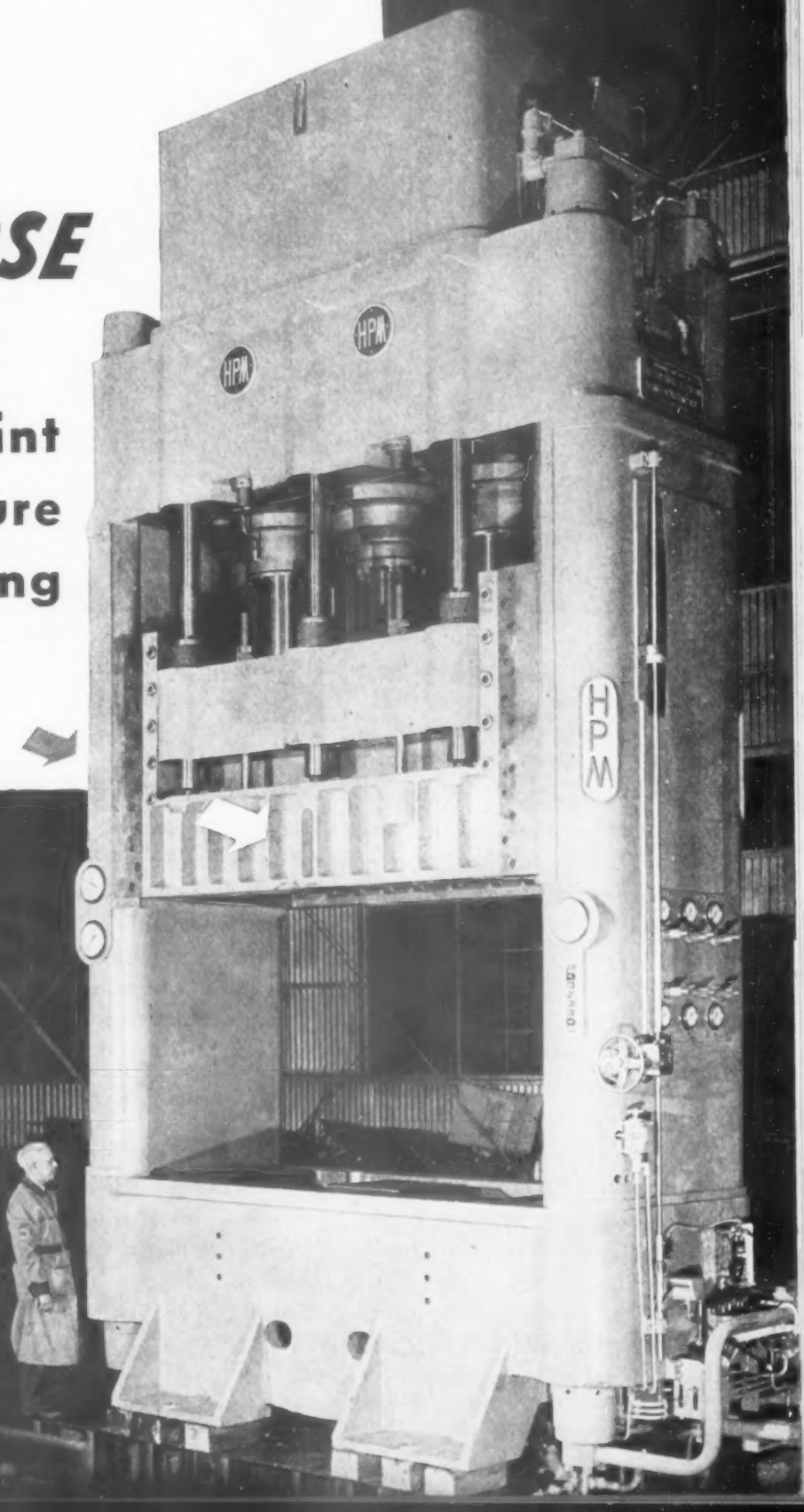
HPM

FASTRAVERSE PRESSES

with New 6 Point Variable Pressure Blankholder Ring

Pressing Member	Main Slide	Blankholder Slide	Die Cushion Platen
Pressure Capacity (tons-net)	750	300	125
Pressing Surfaces (L.R x F.B)	105"x38"	120"x60"	90"x40"
Daylight Openings (Max.) Main Slide to Bed	114"	----	----
Blankholder Slide to Bed	----	96"	----
Ram Travel (Max.)	42"	27"	10"

The dependable long life HPM HYDRO-POWER Radial Pump powers every HPM Hydraulic Press.



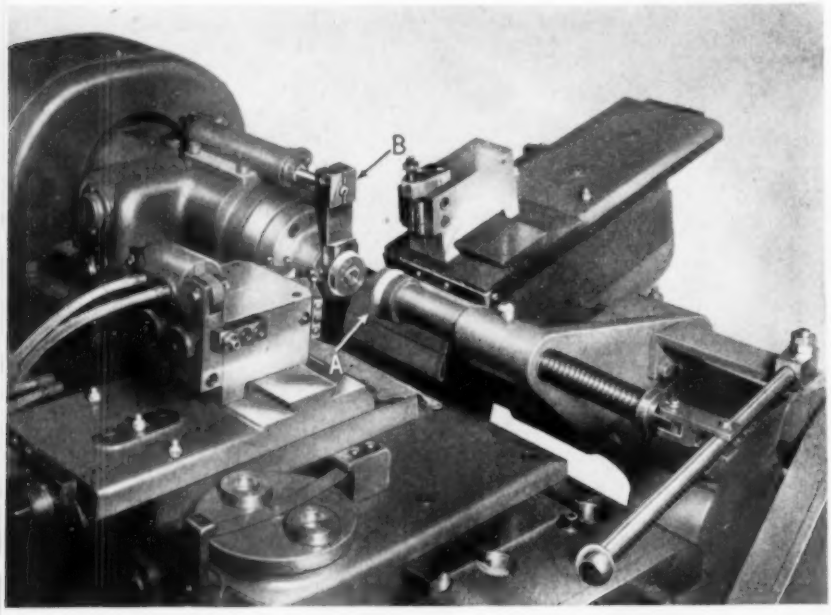
Employing the HPM Closed Circuit system of shockless operation, these large HPM Fastraverse Blankholder Presses with variable 6 point pressure ram resistance on the periphery of the blankholder ring are especially adaptable to the deep drawing of large aircraft parts. The pressure of each of the six blankholder rams can be adjusted individually and independently. Separate hydraulic die cushion fitted into the press bed can also be used as an ejector, when desired. The two slides locked together give single action service increasing the maximum pressure capacity to 1000 tons. Investigate this versatile press for both present and future deep drawing requirements. » » »

THE HYDRAULIC PRESS MFG. COMPANY
Mount Gilead, Ohio, U. S. A.

District Sales Offices: New York, Syracuse, Detroit and Chicago. Representatives in Principal Cities.

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



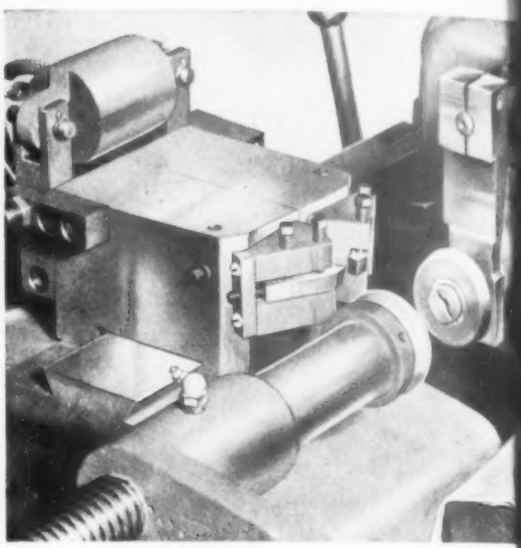
Problem: To automatically turn the O D and face both sides of bronze discs on a high production basis.

Solution: Since the total machining time involved in the above operations is a matter of seconds, the advantages of a set-up providing a continually-running Headstock Spindle were apparent. An IMP Automatic Lathe equipped with continually running spindle and air-operated chuck collet was selected. A simple, hand-operated, mechanical loader was then designed as illustrated above.

The operator pre-loads a rough disc on the loader at position "A" and, with spindle revolving, simply pushes the work on the air-operated arbor where it is accurately positioned by locating arm "B". The position of this arm is controlled by an air cylinder which is operated automatically in conjunction with the feed cycle. The arm is in the forward, or "out" position when work is loaded; then is automatically retrieved to the "in" position during the operating cycle to provide sufficient clearance for the inside facing tool.

The O D of the disc is turned with a constant-profile form tool mounted on the Back Squaring Attachment. Both sides of the piece are faced with two independent tools, mounted in relieving type tool blocks on the Front Carriage, as illustrated at the right. These tool blocks are automatically operated by an air cylinder and controlled by cams mounted on the cam shaft.

Lo-swing IMP AUTOMATIC LATHE WITH CONTINUALLY RUNNING HEADSTOCK SPINDLE IS LOADED WITH HAND-OPERATED MECHANICAL LOADER



The principal advantages of the continually revolving spindle on short cycle work are:

- Handling time considerably reduced due to elimination of starting and stopping time.
- Less wear and tear on such rapidly revolving parts as clutches, brakes, pulleys, belts, etc. as these parts are revolving continually instead of being subject to quick starting and stopping wear every few seconds.
- Smaller size motors may be used as the motor is running continually under ideal conditions.

The principal advantages of hand-operated loaders are:

- Loading time considerably reduced, as the rough part is accurately suspended close to the chuck and pushed into position with a quick movement of the loading lever.
- Less wear and tear on the chuck collet as the loading plunger is accurately aligned with the collet and the rough piece is slipped on without touching the end of the collet.
- Inexperienced help can operate lathes with greater safety and rapidity.

Just Put Chuck on Machine and Start Work

.....No AUXILIARY EQUIPMENT

is needed with

PERMANENT MAGNET TYPE

MAGNETIC CHUCKS

—because Permanent Magnets Provide the Holding Power

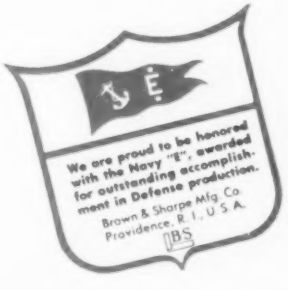
No complicated installations are required when you use Brown & Sharpe Magnetic Chucks of the Permanent Magnet Type. No special preparations are necessary — no wiring — no auxiliary current supply or generators. Simply place the chuck on the machine where it is to be used and commence work. Small sizes are transferred easily from machine to bench for hand operations.

Perhaps Brown & Sharpe Magnetic Chucks would help you in maintaining your production quotas in the armament program. Or their efficiency and simplicity of operation might aid in a saving of manpower. Complete range of sizes for all ordinary requirements. Magnetic chuck catalog sent on request. Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

NO WIRES—NO HEATING—NO OPERATING COSTS

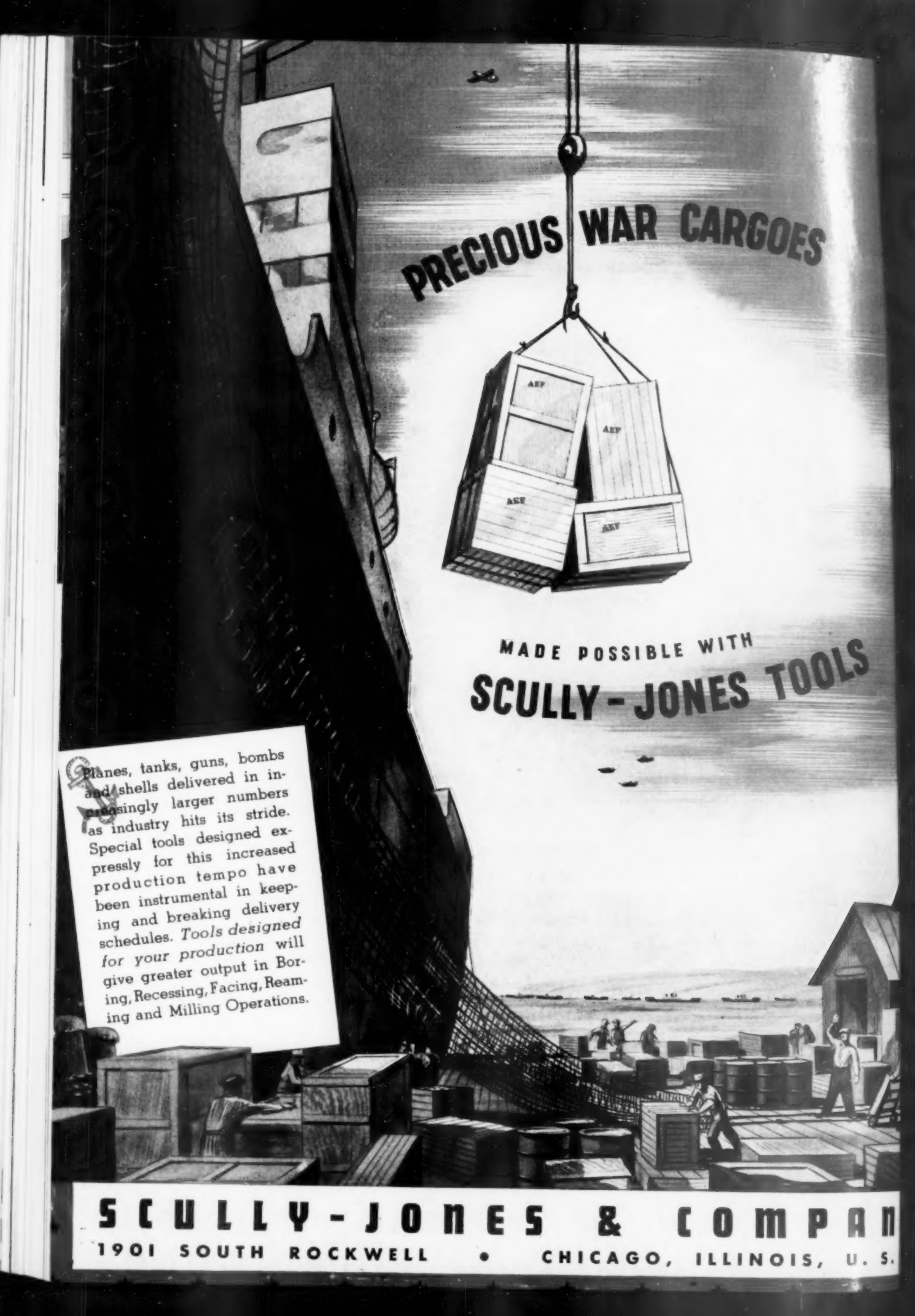
UPPER, 9" Rotary Model No. 9R holding work for light turning in lathe. This chuck, while especially suited for grinding operations, can be used for other light machine work.

LOWER, Rectangular Model No. 1236. This 12" x 36" chuck, the largest stock size in the line, is suited for large work or for groups of duplicate parts.



For sale only in the U. S. A. and its Territories and in Canada.

BROWN & SHARPE


PRECIOUS WAR CARGOES
MADE POSSIBLE WITH
SCULLY-JONES TOOLS
Planes, tanks, guns, bombs and shells delivered in increasingly larger numbers as industry hits its stride. Special tools designed expressly for this increased production tempo have been instrumental in keeping and breaking delivery schedules. *Tools designed for your production* will give greater output in Boring, Recessing, Facing, Reaming and Milling Operations.
SCULLY-JONES & COMPAN
1901 SOUTH ROCKWELL • CHICAGO, ILLINOIS, U. S.

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